

NATURE & FAUNE

Volume 23, Issue 1

Forest Management in Africa: Is Wildlife taken into account?



FAO Regional Office for Africa



Front Cover Photos, From Left:

Top: FAO/ FO -0964, Guinea fowl, Somalia, Susan Braatz; FAO/ CFU000393, Bee eaters (*Merops nubicus*), Zambia, Roberto Faidutti; FAO/ FO -5569, Giraffe in West Africa, Niger, Marguerite France -Lanord; FAO/ FO -6256, *Cedrus atlantica* forest, Morocco, Gillian Allard

Bottom: FAO/ FO-6274, Bales of lichen, collected in cedar/oak forest, ready for shipment, for use in the perfume industry, Morocco, Gillian Allard; FAO/ FO -0380, *Acacia nilotica* on the banks of the river Nile, Sudan, Christel Palmberg Lerche; FAO/ FO -6339, Riverine vegetation, Tanzania, Gillian Allard; FAO/CFU000204, Peul shepherds set fire to a forest to create pasture, Central African Republic, Roberto Faidutti

Back Cover Photos, From Left:

Top: FAO/ CFU000280, View of a primary forest, Uganda, Roberto Faidutti; FAO/ CFU000384, Forester working with a villager to decide what species to plant, Mali, Roberto Faidutti; FAO/ CFU000423, Acacia forest, Kenya, Roberto Faidutti

Middle: FAO/ CFU000231, Mangrove forest near the mouth of a river, Mozambique, Roberto Faidutti; FAO/ FO-5561, Zebras and giraffes in Etosha Park, Namibia, Marguerite France -Lanord; FAO/ CFU 000236, View of a forest with waterfall, Guinea, Roberto Faidutti.

Bottom: FAO/ FO -0921, Ostrich in the Serengeti, Tanzania, Susan Braatz.



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Accra, 12 January 2009

Dear Sir/Madam,

It is our great pleasure to send you Vol. 23, Issue 1 of Nature & Faune magazine, an international bilingual (English and French) publication of the FAO Regional Office for Africa. The magazine is an information source for a broad audience in Africa and other continents, containing articles and papers from policy makers, researchers, wildlife authorities, students etc. The aim of the journal is to disseminate information (scientific and technical knowledge) and promote the exchange of experiences on wildlife, protected area management and the sustainable use and conservation of natural resources in Africa.

Subscription is free and can be obtained by sending an e-mail to: Nature-faune@fao.org. Any suggestions, comments or contributions of any kind can also be sent to this email address.

Past issues of the magazine can be downloaded from the Nature & Faune website:

<http://www.fao.org/world/regional/raf/workprog/forestry/magazine.en.htm>

The theme for the next issue is "Success stories in management of wildlife and nature in Africa". The "Call for submission" and the "Guidelines for Authors" can be downloaded from the website above.

With kind regards,


The Editorial Board

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Nature & Faune

Vol. 23, Issue 1

Forest Management in Africa: Is wildlife taken into account?

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Wildlife in forest management in Africa

Robert Nasi¹

Importance of wildlife for the maintenance of functional forest ecosystems

Human activities in tropical forests are disruptive processes and can trigger numerous, yet not completely understood, mechanisms or effects which will in turn alter, in a more or less significant way, the overall function, structure and composition of the ecosystem. Plant regeneration (loss of pollinators, seed dispersers and seed predators), food webs (loss of top predators or of their prey), and plant diversity (change in herbivory patterns, increased pests) are amongst the various processes dependent upon the presence of wild fauna. Some species or functional groups matter more than others in maintaining ecosystem processes and integrity. "Keystone species", "ecosystem engineers" or organisms with high "community importance values" refer to species whose loss has a disproportionate impact on the ecosystem when compared to the loss of other species. Conventional wisdom predicts that the reduction or extirpation of these animals will result in dramatic changes to the ecosystems.

The importance of considering these keystone species in forest management is illustrated by the many examples. Large cats' extirpation triggers an uncontrolled growth of the prey population which in turn dramatically increases browsing or grazing intensity to the point where forest regeneration can be totally prevented. Elephants have a tremendous role in modifying vegetation structure and composition through their feeding habits (differential herbivory, seed dispersal) and movements in the forest (killing a large number of small trees). Wild pigs (*Sus spp.*, *Potamochoerus sp.*, etc.) and some antelopes are among the most active seed predators. A significant change in their population densities will have a major effect on seedling survival and forest regeneration. Many key forest tree species such as *Milicia excelsa* (Iroko) are disappearing or are not regenerating properly because the role of fruit bat, (*Eidolon helvum*), in seed dispersal, survival, and germination has not been considered in forest management.

Importance of wildlife for the livelihoods of local people

Wildlife has important livelihood aspects and serves multiple roles. Wildlife products are often major items of consumption or display and have high medicinal and spiritual values in many human cultures. Bushmeat and other wildlife products offer a number of benefits to forest dwelling populations. These are easily traded resources: transportable with a high value/weight ratio and easily preserved at low cost. It often represents both the primary source of animal protein and the main cash-earning commodity for the inhabitants of the humid forest regions of the tropics. Cash income from the sale of wildlife products can be highly variable, even when the same resource category is considered. While those products destined for international markets fetch much higher prices (a breeding pair of Lear's Macaw is worth around \$100,000 on the black market) than locally consumed goods and the unit value of wild meat is low, the returns from hunting are generally higher than average local wages. The maintenance of healthy wildlife populations is therefore essential for local livelihoods and cultures. The main threat to wildlife is generally poaching or overhunting, both in humid and dry Africa.

If current levels of hunting persist in Central Africa, bush meat protein supplies will fall dramatically and a significant number of forest mammals will become extinct in less than 50 years. However, if bush meat harvests are reduced to a supposedly sustainable level, millions of people will be seriously affected by the immediate loss of wild protein supply in a region where poverty and malnutrition are already rife. This is exacerbated by the fact that wildlife is further impacted by the industrial extractive sector

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(logging, mining, and oil-drilling, primarily) because in the course of their activities, companies directly destroy critical habitat, disturb movement patterns and alter behaviour of local wildlife; as well as indirectly facilitate hunting by building roads and/or providing hunters with transportation. The establishment of camps with better living standards than surrounding villages creates an immigration flux and increases demand for protein, while as industrial activities stimulate the local economy, increased income allows hunters to take advantage of new technologies which allow for a more efficient harvest (e.g. cartridges, guns, snare wires, outboard motors and headlamps). Research has shown that per capita harvest rates in local communities adjacent to logging infrastructures are three to six times higher than in communities remote from such areas.

The need to consider wildlife in forest management in Africa

For timber concessions, we must incorporate wildlife concerns into forest management plans that until now have only focused on timber. Such integrated timber and wildlife management plans should include: wildlife regulations in company policy; conservation education for logging company employees and local communities; an agreed system of law enforcement to be carried out by locally recruited staff; development of alternative protein supplies (e.g. fish farms); and an intensive program of socio-economic and ecological monitoring. The private sector will benefit from a decrease in theft of company property due to the increased law enforcement, an enhanced corporate image, and improved opportunities for timber certification. The local communities will benefit because the management programme supports their traditional land tenure system and provides a range of employment opportunities. Wildlife conservation will benefit from a reduction in threats, from some of the protection costs being borne by the private sector, and from this protection extending beyond the boundaries of “protected areas”.

Wildlife can also be the main reason or objective to manage a forest area as illustrated for hunting in Burkina Faso (zones d'intérêt cynégétique villageoises), Central African Republic (zones cynégétiques villageoises) or for both hunting and tourism in Zimbabwe (Campfire program). These approaches (community based management of trophy hunting, selling game meat harvesting wildlife products, sightseeing tourism...) aim at managing natural resources so that plants, animals and people benefit. They provide legal ways for communities to raise money by using local, wildlife resources in a sustainable way and conserving the forests.

Rather than restricting the rights of forest dwellers to engage in a market economy involving wildlife, the answer lies in fostering these rights, in accepting the premise that decisions to consume or conserve wildlife should ultimately rest with people directly dependent on this wildlife. Only if local people are granted the right to make resource-related decisions, will they embrace the responsibility to sustain these resources.

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Announcements

New Leadership

Mr. Foday Bojang takes reins of office

We are delighted to announce that we have a new Editor, Mr. Foday Bojang, with whom we launch this Issue of *Nature & Faune*. Mr. Foday Bojang assumed duty on 15 July 2008 as Senior Forestry Officer in the FAO Regional Office for Africa, Accra Ghana. He brings along to this position a wealth of experience on African Union matters, where he served for 10 years as the Head of Environment and Natural Resources Division. He was active in crafting the Concept Note and the Programme of Implementation for the Green Wall for the Sahara Initiative and a number of other initiatives. Mr. Bojang served in the Forestry Department of the Gambia from 1980 to 1998, rising to the position of Director in 1992. He joined the then Organization of African Unity (now African Union) in August 1998. Mr. Bojang succeeds Mr. Eduardo Mansur.

Eduardo Mansur and Lonneke Bakker step off the Editorial Board

Mr Eduardo Mansur left FAO in March 2008 after a brief but remarkable tenure as the editor of *Nature & Faune* and FAO Regional Forestry Officer for Africa. Mansur joined the International Tropical Timber Organisation (ITTO) as an Assistant Director, Reforestation and Forest Management with residence in Japan.

Ms. Lonneke Bakker successfully carried out her duties as an Assistant Editor of *Nature & Faune* for almost 4 years. She left FAO in June 2008 at the end of her tour to join WWF Netherlands where she has taken up duty as a thematic expert on species conservation. Ms. Bakker is credited for her contributions in revitalizing *Nature & Faune* and producing the first digital copy of the magazine.

The Editorial Board of the *Nature & Faune* expresses gratitude for all that Eduardo and Lonneke contributed to the magazine over their period of tenure. We will miss Lonneke's quick wit and Eduardo's innovative and adventurous mindset on the Board.

Message to Readers

FAO Regional Office for Africa – Natural Resources/ Fisheries/ Forestry Technical Team¹

Thematic News

This is a special edition of *Nature & Faune* magazine. We have heard news in recent months (August and September 2008) of governments of Cameroon and Nigeria providing new conservation support to Cross river gorillas. Rwanda and Burundi also came together to sign an agreement to safeguard the largest remaining block of mountain forest in East Africa inhabited by endangered primates such as chimpanzees, rare-owl faced monkeys, and other species found nowhere else on earth. Are wildlife conservation and sustainable utilization explicitly taken into account in the design and implementation of management plans for these forest ecosystems and others in different parts of Africa? Were these positive steps incidental? Whichever the case we need to consolidate gains achieved and make new advancements.

Focus

Although the broad idea conveyed by this special edition of *Nature & Faune* magazine is putting wildlife management squarely into forest management in Africa, this theme expands to include topics such as collaborative efforts between wildlife and forestry practitioners. It reviews what is going on in Wildlife and Protected Areas management in Africa and how this relates to forest management; as well as appraisal of the extent of involvement of rural people in conservation. In addition, we have in the menu a special feature on *Rethinking West African Forest Management with a Regional Approach*. As themes are often interpreted in diverse ways regardless of the original intent we received quite a bevy of manuscripts from which we are publishing those that are related on a deeper, more abstract level.

In focussing on Morocco in this Issue, a virtual conversation with Dr. Moulay Youssef Alaoui on Morocco's efforts in managing its forests to develop its wildlife is presented.

Articles

Traditionally *Nature & Faune* carries only 4 articles. In this issue, however, we are offering our readers ten articles which make this a special edition! The articles shine the spotlight on both moist and dry forest ecosystems and explore how wildlife conservation and sustainable use are integrated into management plans of forest concessions of the Congo Basin in central Africa sub-region. The use of landscape approaches to improve the integration of wildlife in forest management plans and managing production forests for biodiversity are also examined. Community based actions have not been left out as portrayed by the experience in Tayna Natural Reserve in Democratic Republic of Congo. Studies to determine the financial potential of big games in tourism and establishing the maximum and minimum exploitation values for these big games give you an idea about the financial gains that could accrue from big game based tourism.

A summary of the CBD Technical Series publication “Conservation and Use of Wildlife Based Resources: The Bushmeat Crisis” (Nasi et al., 2008) is included in this Issue. It presents a number of policy recommendations to improve the sustainability of wildlife-based resources use in tropical forests, including strengthening national ownership of bushmeat in a way that provides long-term local and national benefits. Another article presents a different type of bushmeat – aquatic bushmeat. The authors

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describe traditional fisheries in rivers within rainforest ecosystems of the Campo-Ma'an area of Southern Cameroon and analysed it to illustrate aquatic animal resources of rainforests as important targets of community activity.

Call for action

The menu served in this Issue of Nature & Faune does not only focus on finished product, it also turns the spotlight on ongoing studies on biodiversity in forest concessions of central Africa. There is an appeal for research on the impact of harvesting the nuts of *Allanblackia* (an indigenous tree of the wet tropical Africa) on wildlife.

In concluding this edition, a summary report of the 16th Session of the African Forestry and Wildlife Commission (AFWC) held in February 2008 in Khartoum, Sudan and its results and recommendations are presented for your information and/or action as appropriate.

Finally, we hope that this special edition would bring to light the importance of taking wildlife into account in the management of Africa's forests and stir up deep concerns for action.

Thematic News

FAO creates a website for wildlife and protected areas activities

Source: FAO Forestry Department, Viale delle Terme di Caracalla
00153 Rome, Italy

A website for wildlife and protected areas activities is now up and running in the FAO Forestry Department.

For more information, please see: <http://www.fao.org/forestry/44517/en/>

Over 125,000 endangered western lowland gorillas discovered in the forests of the Republic of Congo

Source: Environment News Service, P.O. Box 10036, Seattle, WA 98110

Wildlife Conservation Society (WCS) and Congolese scientists announced on 5th August 2008 that over 125,000 endangered western lowland gorillas discovered in the remote northern forests of the Republic of Congo.

For more information, please see:

<http://www.ens-newswire.com/ens/aug2008/2008-08-05-02.asp>

The world's foremost primate authorities met at the 22nd International Primatological Society Congress,

Source: Environment News Service, P.O. Box 10036, Seattle, WA 98110

According to the 22nd International Primatological Society Congress that met in Edinburgh the week of 5 August 2008, some monkeys, apes and other primates are hastily on their way to being *eaten to extinction*. The primate expert Russell Mittermeier, president of Conservation International said "We've raised concerns for years about primates being in peril, but now we have solid data to show the situation is far more severe than we imagined,"

For more information, please see:

<http://www.ens-newswire.com/ens/aug2008/2008-08-05-01.asp>

Governments of Cameroon and Nigeria provide new conservation support to Cross river gorillas.

Source: Environment News Service, P.O. Box 10036, Seattle, WA 98110

The governments of Cameroon and Nigeria are providing new conservation support to Cross river gorillas which scientists say only 300 individuals are left in the wild. These great apes are known live exclusively in Cameroon and Nigeria.

For more information, please see:

<http://www.ens-newswire.com/ens/sep2008/2008-09-05-02.asp>

Rwanda and Burundi come together to sign an agreement to safeguard mountain forest in East Africa

Source: Environment News Service, P.O. Box 10036, Seattle, WA 98110

Rwanda and Burundi come together to sign an agreement to safeguard the largest remaining block of mountain forest in East Africa inhabited by endangered primates such as chimpanzees, rare-owl faced monkeys, and other species found nowhere else on earth.

For more information, please see:

<http://www.ens-newswire.com/ens/sep2008/2008-09-16-01.asp>

STEWARD: Rethinking West African Forest Management with a Regional Approach

Shelley W. Saxen, Scott Bode, Diane Russell³

The Sustainable and Thriving Environments for West Africa Regional Development Program (STEWARD) is a joint effort spearheaded by the US Agency for International Development (USAID) and the US Forest Service (USFS). STEWARD's aim is to foster greater regional collaboration to improve natural resource management (NRM) and livelihoods in the Upper Guinean Forest Ecosystem. STEWARD provides a platform for generating a more coherent and strategic regional approach to address regional threats to biodiversity as well as capitalize on regional opportunities to spread best practices, harmonize policies, and improve regional markets. Using a regional approach to forest management presents unique opportunities to better address wildlife management in West Africa.

The impetus for STEWARD derived from a realization that addressing NRM and sustainable development needs within the Upper Guinean Forest Ecosystem requires a holistic, integrated, large-scale approach to achieve significant, long-lasting successes. Countries were coming out of conflict where borders became increasingly permeable - people, animals and goods moving rapidly within and outside the region. Moving beyond an exclusively small-scale, site-specific focus and recognizing essential socio-ecological interconnections and interdependencies across the region, STEWARD is designed to support the sharing of best practices to enhance natural resource management and livelihoods in the region. The current natural resource situation in the region is fast-paced and challenging, with governments and local people facing a multitude of new investors and policy initiatives. Hence the need to share lessons and models within the region and with actors outside the region who have experience and knowledge. USAID and USFS have significant regional as well as global presence and experience in sustainable natural resource management, thus STEWARD is well-poised to make significant positive impacts with its regional focus. Wildlife, in particular, is well placed to benefit from a regional program that acknowledges migration corridors across borders and fundamental interdependencies that must be supported to improve wildlife management beyond the national level.

Year 1:

In STEWARD's first year, the program will address forest management, wildlife management, marine and coastal zone issues, biodiversity conservation, and policy harmonization between governments from a regional perspective in five countries in West Africa: Guinea, Sierra Leone, Liberia, Cote d'Ivoire, and Ghana.

A regional scale initiative in the Upper Guinea ecosystem promotes the transfer of knowledge and lessons among countries. For example, in Côte d'Ivoire and Ghana, lessons are being learned about cocoa production in relation to natural forest conservation. Liberia is a leader in forest policy reform and timber certification procedures. Guinea has pioneered participative forest management in the region. Other West African countries are advanced in approaches to natural regeneration of degraded lands and in decentralized natural resource management. In regard to wildlife management specifically, a regional approach that STEWARD could capitalize on these and other best practices whose impacts include the following:

- Reduction of open access poaching
- Restoration of wildlife populations
- Enhanced protection of endangered threatened species

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²US Agency for International Development, Economic Growth and Trade Bureau, Natural Resources Advisor

³US Agency for International Development, Economic Growth and Trade Bureau, Biodiversity and Social Science Advisor

- Increased biodiversity conservation
- Improvement of ecosystem function and integrity
- Development and modeling of viable incentives for sustainable natural resource management that takes account of wildlife populations
- Increased awareness and codification of community rights and responsibilities in regard to engaged and sustainable management of natural resources in the region.

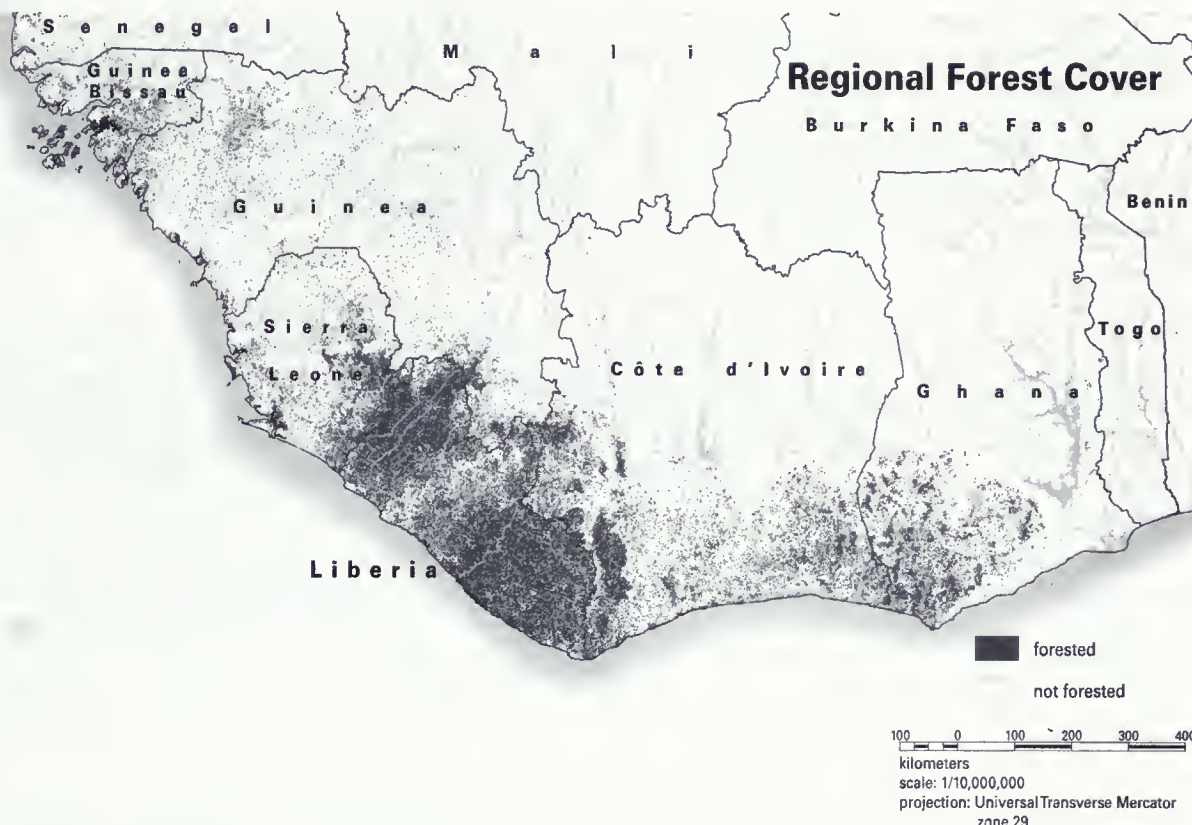


Figure 1: Upper Guinean Forest Ecosystem, Regional Forest cover

STEWARD has benefited and drawn from analyses of the region's biodiversity by Conservation International, Fauna and Flora International and other groups. The Upper Guinean Forest Ecosystem extends from southern Guinea into Sierra Leone, through Liberia and southern Côte d'Ivoire into Ghana. It encompasses 420,000 km² and is a high global priority for biodiversity conservation. The region as a whole has historically been overlooked and under-resourced, and natural resource management practices and systems have, by and large, not kept pace with the evolution and improvements that have occurred in other regions. The region is also under threat from a range of unsustainable practices and land use pressures, extractive industries and as a source area for commodities such as rubber, cocoa and oil palm. Given the recent history of conflict in several of these countries, it is also of strategic importance in terms of peace building.

Due to a variety of factors, original forest cover in the area has been reduced to less than twenty five percent of the region. Critical biodiversity is threatened by extreme habitat fragmentation and land degradation. The complex, multi-sector forces at work necessitate an integrated, regional approach for balancing conservation needs with livelihood and development priorities, building on existing national initiatives in the Upper Guinea countries. It is in response to this need that STEWARD was created.

⁴US Forest Service FRAMEweb site: www.frameweb.org/ev_en.php?ID=7709_201&ID2=DO_TOPIC
 STEWARD FRAMEweb site: www.frameweb.org/ev_en.php?ID=92332_201&ID2=DO_COMMUNITY

STEWARD focuses on key regional concerns: 1) harmonizing forest, wildlife, and conservation policies to mitigate illegal movement and unsustainable use of natural resources; 2) promoting improved markets and management for high value tree crops that provide benefits to smallholders and help governments diversify extractive-industry based economies; 3) developing a regional presence in global fora for conservation, sustainable development and trade; 4) assisting the region to more effectively manage and capitalize on influxes of investment and trade in natural resources; 5) developing regional strategies for coastal and fisheries management, and (6) accelerating the flow of knowledge and experiences about best practices. USFS has led activities including a sub-regional workshop on sustainable forest management held in Conakry, Guinea in November 2007 and has supported Mano River Union (MRU) meetings between the countries of Guinea, Sierra Leone, Liberia, and Côte d'Ivoire as well. Proceedings from the workshop and MRU meetings and two STEWARD assessments thus far completed will be available online. The two analytical documents produced by STEWARD to date include: 1) a desk study called the Biodiversity Analysis and Technical Support for the Sustainable and Thriving Environments for West African Regional Development Program (STEWARD) and 2) a one-month field assessment called the Environmental Assessment and Strategy for the Sustainable and Thriving Environments for West African Regional Development (STEWARD) Program.

As STEWARD moves through its first year, it will begin to network groups who are building capacity for increased regional collaboration in biodiversity conservation, fisheries, wildlife, forestry, sustainable agriculture and trade within national and regional institutions. A request for applications to receive small grants from STEWARD opened in the summer of 2008 and was posted on the STEWARD FRAMEWeb site. It will foster regional policy innovations and harmonization of national policies for improved ecosystem conservation and natural resource management. STEWARD will further support transboundary conservation and natural resource management activities at selected sites within the region. Multilateral collaborative action and knowledge sharing is at the heart of the STEWARD approach. As STEWARD develops and evolves, its partners and learning approach can provide a model for regional natural resource management initiatives that extend beyond the bounds of the West African sub-region and demonstrate more effective wildlife management.

⁵STEWARD FRAMEweb site: www.frameweb.org/ev_en.php?ID=92332_201&ID2=DO_COMMUNITY

SUSTAINABLE MANAGEMENT OF MAMMALS IN MANAGED FOREST CONCESSIONS ON THE OUTSKIRTS OF PROTECTED AREAS IN THE CONGO BASIN

Project for the development of a practical evaluation and monitoring method for wildlife in ALPICAM forest concessions at the outskirts of the Lobéké national park, Southeast of Cameroon

Didier Bastin¹ and Corinne Maréchal²

Summary

The paper reports the on-going and future implementation of a project about the development of a practical evaluation and monitoring method of the status of mammals in ALPICAM forest concessions on the outskirts of the Lobéké national park (Southeast of Cameroon). The objective is to develop a management tool for large mammal fauna intended for forest managers and logging companies.

Background

Today it is an established fact that forests located outside protected areas (PAs), particularly production forests, can play a key role in the conservation of wildlife in the Congo Basin (better efficiency of PAs, reduction of the effects of habitats fragmentation, fight against poaching, etc).

It is generally accepted that forest concessions located as set-aside areas can play a major and strategic role in maintaining the PAs' integrity, both in view of their large area (role as buffer zone) and their wildlife (role as reservoir and refuge) (Tutin *et al.*, 2001).

Moreover, since the 90s, the legal framework for logging in the sub region has evolved towards a better integration of biodiversity. Henceforth, logging companies are subjected to development standards integrating in a more or less detailed form the 'wildlife' component in their forest management activities (Billand *et al.*, 2005).

However, as regards large fauna, there is currently no inventory and monitoring standard adapted to the specific situation of managed forest concessions. This lack of standardization could hinder the realization of sustainable management objectives, that is an integrated (for example at the massif level) and in the long term (monitoring) approach of the management of fauna in production forests (Maréchal, 2006).

Moreover, the management efforts expected of timber operators require human and material resources. However, these are limited in the specific context of forest industry and its various peculiar constraints. Thus, logging companies are still very limited in terms of availability of resources to implement the most appropriate approach on their concessions.

ALPICAM recently launched a project aiming at making up for the lack in wildlife evaluation and management in forest concessions. This article outlines the main aspects of this project.

Objectives of the project

Generally speaking, the project aims at establishing a management (inventory and monitoring) standard for wildlife adapted to the context of forest exploitation, regarding both technical and financial means to be mobilized and 'non-specialized' skills commonly available at logging companies level.

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In practice, various specific objectives aim at:

1. the evaluation of different wildlife inventory methods implemented to date in the context of the presentation of forest concessions management plans, that is: the line transect, the recce-transect and the recce;
2. the formulation of a standardized inventory methodology applicable to the specific case of managed forest concessions;
3. the development of a monitoring protocol integrating wildlife inventories and possibly various other tools used to monitor the changing trends of animal populations (monitoring of hunting efforts and success, examination of captures, call method, observations in the forest clearings, etc.);
4. the verification of monitoring recommendations in different forest management units (FMUs) relatively 'insignificant' as regards their wildlife resources;
5. the proposal of a “control panel” and sustainable wildlife management monitoring indicators, with a specific objective in the context of forest certification.

Study sites and proposed methodology

The project is carried out in Southeast of Cameroon (East Province), in forest concessions already managed or being managed by ALPICAM and GRUMCAM logging companies (ALPI Group) [See chart on fig.1]. It is designed on a research-action concept which consists in combining research activities (results and analysis) with the verification of recommendations drawn from the project (validation).

It concerns FMUs 10-013 and 10-063 (Kika FMUs), near the Lobéké national park (LNP) and integral part of Sangha Tri-national (STN), and FMUs 10-026, 10-051 and 10-053 (Mindourou FMU) located in the Ndama-Ndjiwe massif accommodating ALPICAM-GRUMCAM and the Decolvenaere Group (GDC) which collaborate on various aspects of their forest management activities.

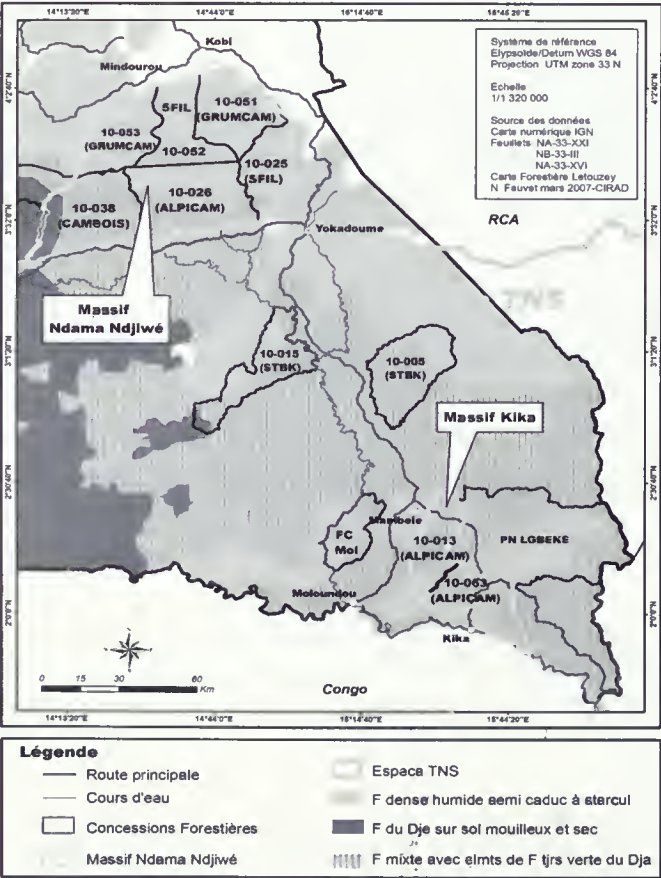


Figure 1. Status of the ALPI group and partners FMUs in Southeast Cameroon

The potentials in wildlife resources in Kika FMUs is still substantial with the proven presence of various charismatic species: elephant, great apes, bongo, sitatunga, etc. (ONFI-HFC, 2003; NZOOH DONGMO *et al.*, 2004). They will serve as 'laboratory' for the elaboration of inventory and standardized monitoring procedures.

The Mindourou FMUs generally have less large mammals and experience an anthropogenic pressure stronger than at Kika (Bombome *et al.*, 2003; BOBO, 2007 a and b). They will serve as testing sites for methods developed at Kika. In principle, the expected positive impact of management measures should be seen there more easily.

Prior to the implementation of actual actions, ALPICAM initiated bibliographical research and analysis concerning wildlife management in the Congo Basin, inside or in close relation to forest concessions. Particular attention is given to wildlife inventory and monitoring procedures. These studies will continue and will be completed with field surveys (interactions with specialists).

In order to address the specific objectives of the project, a series of field activities will follow the initial phase:

Comparison of inventory methods

An assessment of various inventory of large wildlife methods generally used in forest concessions will be conducted on the basis of a comparison of results on the field. In concrete terms, the status of wildlife in the 2 FMUs at Kika will be assessed successively, during one season, according to the techniques of the line transect, recce-transect and recce. Data collected during these inventories will consist of direct and indirect observations of wildlife and human activities. These data will then be converted into kilometric abundance indexes (KAI). A comparative analysis will be conducted on results of the 3 methodologies applied in each FMU. Note that, in 2006, in the context of this project, a comparison of transect inventory method vs recce inventory method has been conducted in FMU 10-053 (Maréchal & Bastin, 2008).

A standardized inventory methodology

On the basis of results from the previous action, the technique with the best performance/costs ratio will be selected as basis for a standardized wildlife inventory methodology. A complete set of procedures will subsequently be elaborated to explain the different aspects of inventory activities: logistical organization, sampling plan, data collection and processing, etc.

Monitoring protocol

Based on the results of the bibliographic analysis, experts' views and **methodological** selection previously carried out, the monitoring protocol most likely to become the standard will be elaborated and formulated. Subsequently, a "test" action programme will be developed to validate the recommendations of the proposed monitoring protocol. These actions will be progressively integrated into management activities in Kika FMUs. This validation programme will be designed and adapted for implementation in Mindourou FMUs. A 'tool box' will be produced and will be accompanied by a document detailing the implementation programme of the monitoring protocol on 'test' FMUs.

Implementation at the forest massif scale

The interventions recommended in the monitoring protocol will be progressively implemented in the Mindourou FMUs in the context of concerted activities for the management of the Ndama-Ndjiwé massif together by GRUMCAM and GDC logging companies while the programme initiated in Kika FMUs will be ongoing. The first results collected during that field phase will be analyzed and compared.

Certification monitoring indicators

Based on bibliographic analysis, known experiences and primary results of our research-action, a list of all monitoring (and evaluation of monitoring performance) of wildlife in forest concessions will be prepared. Among them, key indicators, those that are the most relevant in the context of forest industry, will be selected. A summary table (or 'control panel') will be

proposed to present selected indicators usable by forest managers and other actors of sustainable forest and wildlife resources management. This table will aim at contributing to the practical implementation of the certification approach for a sustainable forest management (SFM) strategy as regards wildlife management in forest concessions.

Beneficiaries

In addition to their usefulness for wild species, actions carried out during the project as well as results obtained will be directly exploited by ALPICAM in the context of sustainable development of its forest concessions in the Southeast of Cameroon and of its SFM certification objective.

The tool produced at the end of the project could contribute to a better knowledge of the considerable resources in large and medium mammals (inventories) and to the monitoring of the impact of human activities (particularly logging and poaching) on wildlife.

The instrument could be useful for all actors in wildlife management in and outside PAs in the Congo Basin: timber operators in general, hunting guides, village communities, NGOs and conservation institutions, the Administration responsible for forests, wildlife and PAs, the scientific community involved in issues of large wildlife management and sustainable management of tropical forests, sustainable forest management certification organizations, etc.

Conclusions and prospects

The project presented in this article intends to establish a wildlife management (inventory and monitoring) standard in the context of logging operations and SFM in production forests in the Congo Basin.

This tool is being conceived for routine use by logging companies. These companies will ensure the continuation of the project through the use of this standard in their management-development activities.

Moreover, the use of standardized methods will make the comparison of results from different sites more relevant. This would enhance the design and planning of wildlife management strategies at the scale of extensive intact forest blocks and not only at concession level, to the extent of the administrative understanding of this term (FMU).

Finally, the tool proposed could equally be disseminated to other stakeholders in wildlife management in the Congo Basin. Due to its practicality, the proposed methodology could be easily used by the COVAREF's and could be integrated in their wildlife resources management system.

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(Natural Resources Management Committee)

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Using landscape approaches to improve the integration of wildlife in forest management plans

Nathalie Van Vliet¹ and Robert Nasi²

SUMMARY

Logging concessions can affect wildlife populations through indirect or direct effects. However, if wildlife is appropriately taken into account in the forest management plans, then logging concessions can become an opportunity for conservation, as they can play a crucial role as buffers around protected areas. In the last decade, large blocks of the Gabonese forests have been surveyed by logging companies to implement the new forestry law. Large data sets were generated with this information but little was done in terms of analysis. In this study we show that this invaluable data, collected during routine management planning processes, can be used to understand the landscape factors that explain mammal distribution in logging concessions and provide very useful recommendations for taking wildlife populations into account in logging operations.

INTRODUCTION

Most of the Gabonese forest is now attributed to industrial logging firms. These concessions can affect wildlife populations through indirect or direct effects (Tutin et al., 2001). Among the direct effects are the modification or destruction of wildlife habitats, the disturbance to animals caused by the noise of logging machinery and the disruption of territorial and gregarious groups of animals. In Lope (Gabon) White (1998) showed that chimpanzee groups, chased from their territory by logging activities, were found to have mortal fights with other chimpanzee groups when trying to settle in an occupied territory. The indirect effects are the increase of hunting activities due to better access to previously remote forest blocks through the development of road networks, the presence of vehicles, etc (Tutin et al., 2001). In numerous cases, logging activities rely on the creation of worker camps in the middle of the forest where the only source of proteins is bushmeat.

However, if wildlife is appropriately taken into account in the forest management plans, then these logging concessions can become an opportunity for conservation, as they can play a crucial role as buffers around protected areas. Since 1996, The Gabonese Law 16/01 (the Forest Code of the Gabonese Republic) requires a detailed and comprehensive forest management plan aimed to maintain the availability of timber over time, but also to limit the negative effects of logging on biodiversity in general and, more particularly, on wildlife species. In the last decade, large blocks of the Gabonese forests have been surveyed by logging companies to implement the Forest Code. These surveys aimed, as a primary goal, at estimating the timber potential from commercial tree species, but they did also consider other ecological parameters including fauna (van Vliet et al., 2004). Although the methodologies used to collect data slightly varied among companies, mammal surveys were generally carried out along parallel and equidistant line transects, also used for the vegetation plots. Indirect signs (dung, footprints, nests etc...) and observed animals were recorded, with information about species, position along the transect, plot number, time of the day and in some cases, perpendicular distance to the transect.

Large data sets were generated with this information but little was done in terms of analysis. At most, the information was used to generate a list of species present in the concession as well as maps showing the spatial distribution of some of the key species. In this study we show that this invaluable data, collected during routine forest management planning processes, can be used to understand the landscape factors

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that explain mammal distribution in logging concessions and provide very useful recommendations for taking wildlife populations into account in logging operations.

MATERIAL, METHODS AND RESULTS

Between 2001 and 2003, the company CBG (“Compagnie des Bois du Gabon”) carried out a forest management survey within its Mandji logging concession (Figure 1). The forest inventory was carried out along 159 parallel and equidistant line transects which covered 1 % of the overall concession area. The survey units were 20 m by 200 m adjacent plots (5711 plots) centred on the transect line.

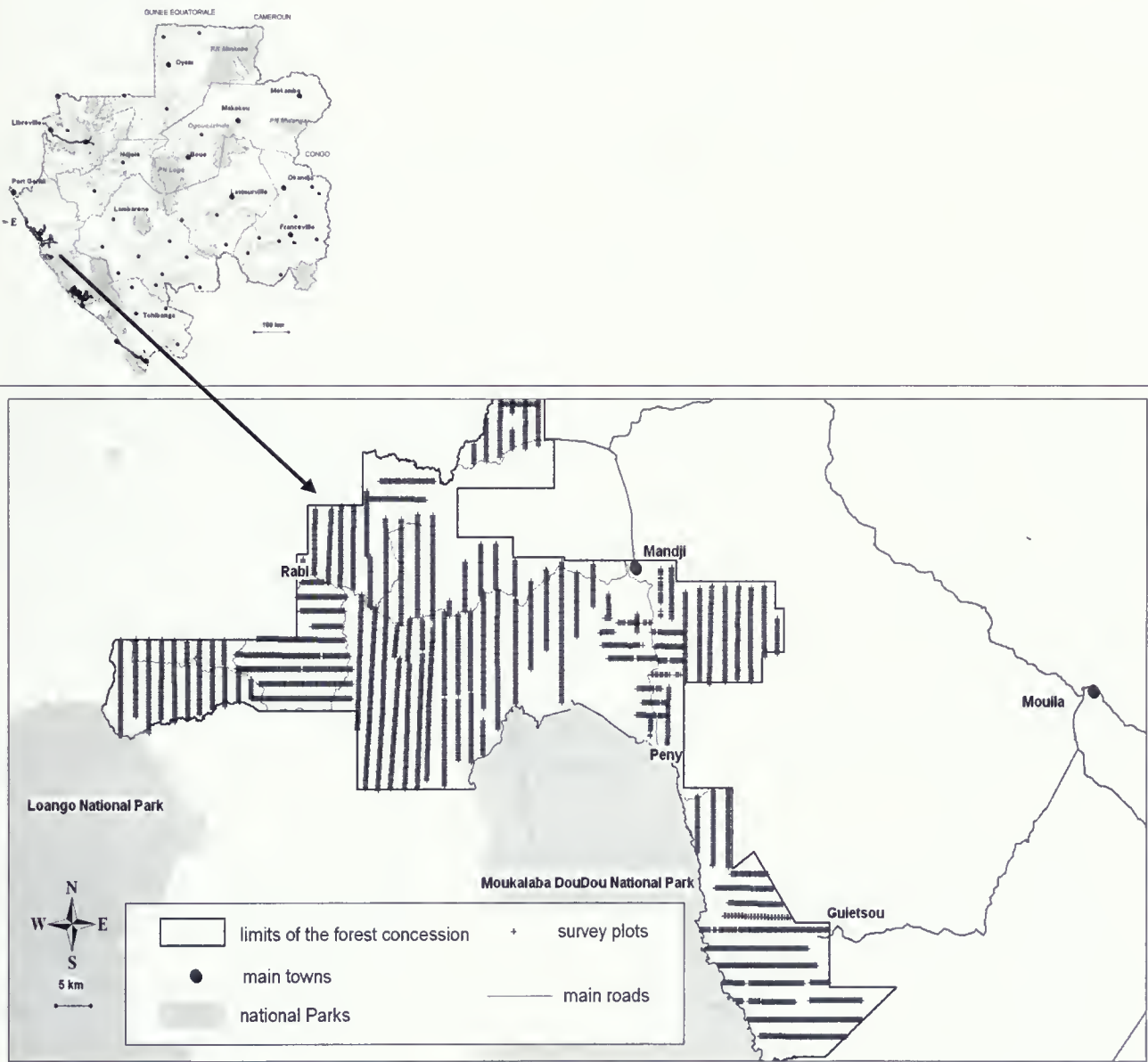


Figure 1 : The Mandji forest concession under sustainable management plan and the system of transects used for “biodiversity surveys”

The mammal survey was carried out using line transect techniques and the information on seen animals and indirect signs (faecal drops) was referred to the corresponding plot. For analyses of the available data we selected species on the basis of 1) importance for local people (duikers (*Cephalophus spp.*), bushtailed porcupine (*Atherurus africanus*), and small diurnal monkeys), 2) charismatic and international conservation value (gorilla (*Gorilla gorilla*), chimpanzee (*Pan troglodytes*), elephant (*Loxodonta Africana*), 3) total protection status in Gabon (aquatic chevrotain (*Hyemoniscus africanus*) and yellow backed duiker (*Cephalophus sylvicultor*)) (Table 1).

Table 1 : Common and scientific names of the mammal species selected for our analysis

Scientific names	Common names
<i>Atherurus africanus</i>	brush tailed porcupi
<i>Cephalophus . cephus</i> , <i>C. nictitans</i> , <i>C. pogonias</i> , <i>Lophocebus albigena</i>	small dirunal monke
<i>C. dorsalis</i> , <i>C. callipygus</i> , <i>C. leucogaster</i> , <i>C. nigrifrons</i> et <i>C. ogylbi</i>	red duikers
<i>C. sylvicultor</i>	yellow back duike
<i>Cephalophus monticola</i>	bleu duiker
<i>Gorilla gorilla</i>	gorilla
<i>Hyemoscus aquaticus</i>	water chevrotain
<i>Loxodonta africana</i>	elephant.
<i>Pan troglodytes</i>	chimpanzee
<i>Potamochoerus porcus</i>	red river hog
<i>Syncerus caffer</i>	buffalo

Plots were also characterized by a series of biophysical parameters: topographic position, canopy cover, abundance of understorey vegetation, abundance of herbaceous species (*Maranthaceae*, *Zingiberaceae* or ferns), abundance of lianas and soil type. All plots where characterized by their distance to waterways, to main roads and to villages. Signs of human activities, such as logging damage or infrastructures (gaps, roads, skidding trails, log yards) and hunting indices (snares, cartridges, hunting camps) were also recorded for each plot. Small rivers, villages and main roads where digitised from a 1/50 000 map and integrated on a GIS where the biophysical characteristics of plots and human and mammal signs were also added. A multiple correspondence analysis (MCA) was computed using Xlstat2006® to identify the biophysical and human factors that better explain the distribution of mammal species within the logging concession. A linear regression and Spearman correlation test were also computed to examine if the probability of encounter of a species co-varied with the main discriminant variables obtained with the MCA. For species that showed no linear correlation, we used the t-test to detect significant differences between means.

The GIS maps show that 20% of the concession is located less than 3 km from a main roads and less than 5 km from a village. Most hunting traces are located less than 3 km from the main roads or at less than 5 km from the bigger cities (Rabi, Mandji, Guietsou, Mbongou I). We found a strong significant positive correlation (Spearman Coef. = **0.676**; p<0,000) between hunting traces and distance from roads. The habitats that sustain the highest mammal richness are the lowland dense forests and the savanna-forest mosaics. Results of a Multiple Correspondence Analysis show that the distribution of mammals within the forest concession is more influenced by roads and hunting than by the direct effects of logging (figure 2). Small diurnal monkeys were found far from the villages and between 3 and 10 km from the main roads (Figure 3). Elephants were equally found close or far from roads and don't seem to be affected by hunting activities. Red duikers avoided hunted zones and were significantly more abundant far from roads. Other species like gorillas, chimpanzees or forest buffaloes showed no negative relationship with distance to roads and were observed close to villages.

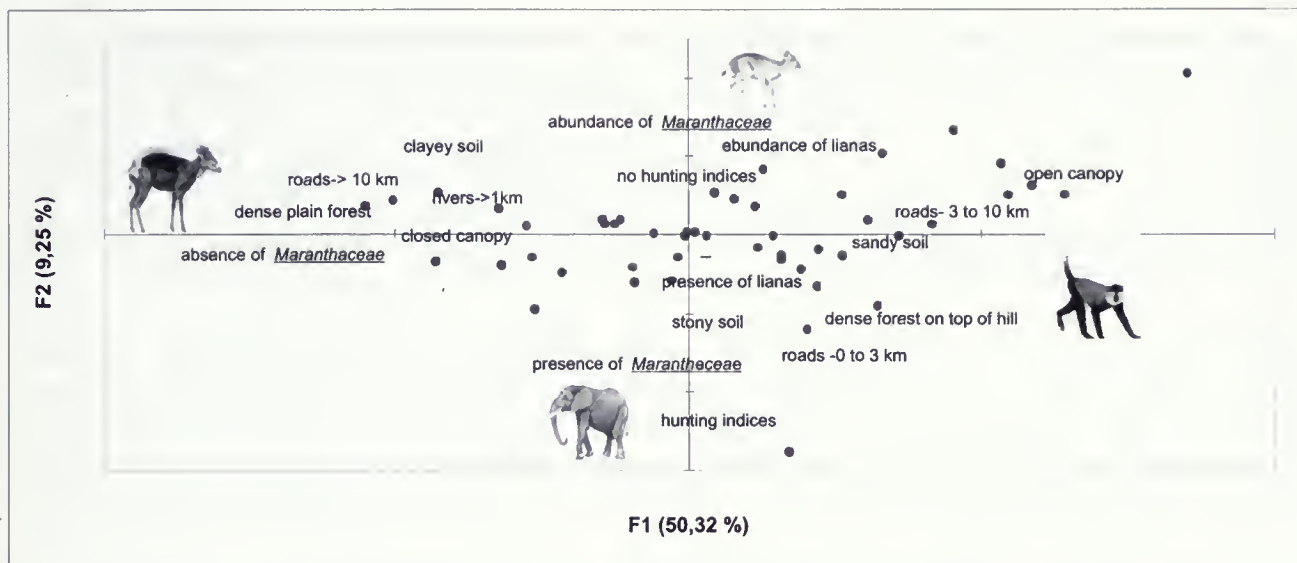


Figure 2 : Relationship between mammal distribution and ecological and human factors as shown by axis F1 and F2 of the Multiple Correspondence Analyses

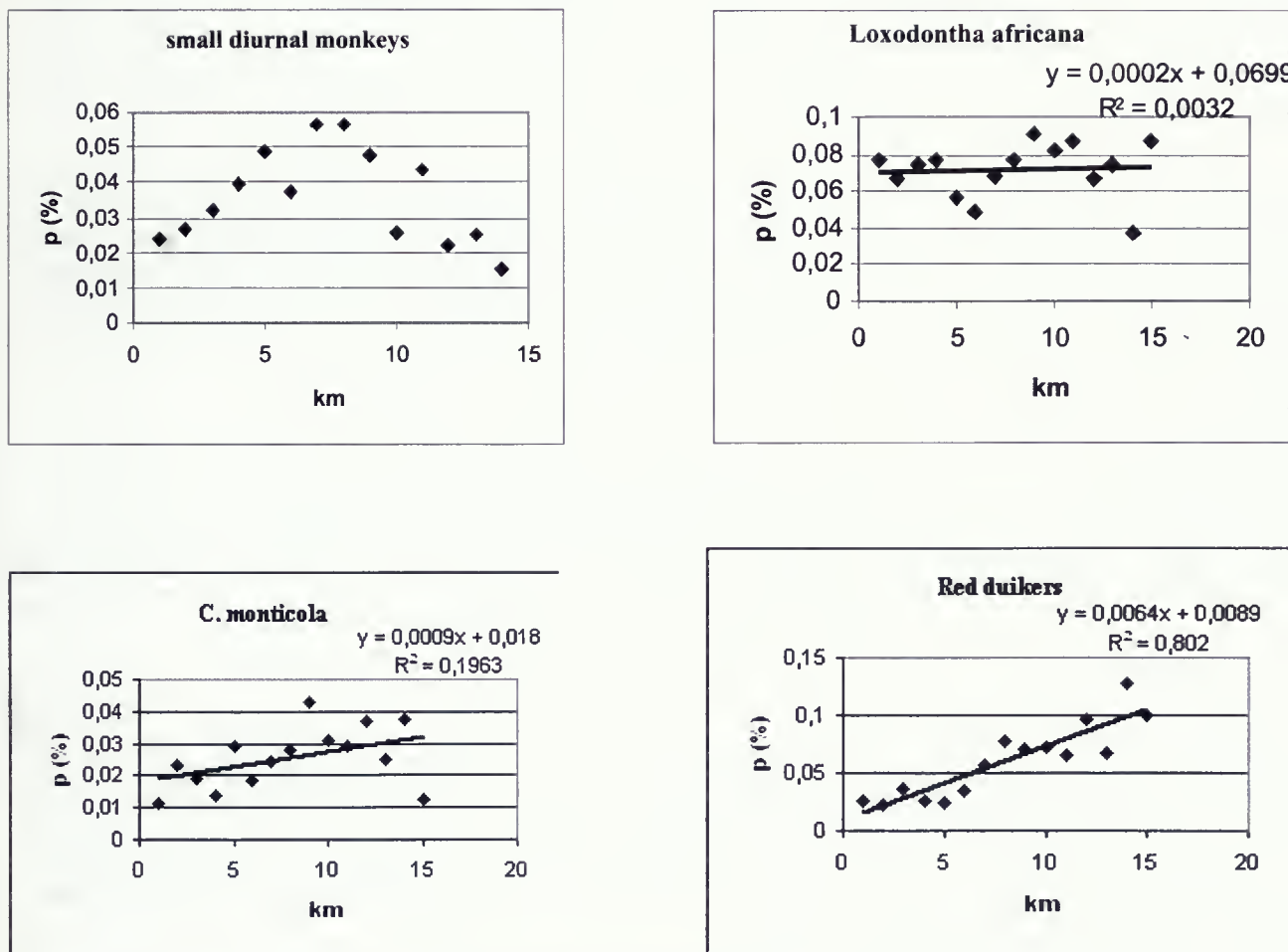


Figure 3 : Species' distribution in relation to distance from roads

DISCUSSION AND CONCLUSIONS

Some of the most hunted species for consumption by local people occur mainly far from areas with a significant human activity. The red duikers and *C. sylvicultor* avoid hunted zones and are significantly more abundant far from roads. Laurance et al. (2006) have shown similar results in South-east Gabon,

concerning the impact of roads on duiker distribution. Small diurnal monkeys are found far from the villages and between 3 and 10 km from the main roads. *Hyemoschus aquaticus*, *Pan troglodytes*, *Gorilla Gorilla*, *Atherurus africanus*, *Syncerus caffer* and *Potamochoerus porcus*, show no negative relationship with distance to roads and were regularly observed close to villages. In our study site, elephants were found equally near to or far from roads. This is contrary to what Blom et al. (2004) demonstrated in a Dzanga-Sangha where elephants avoided the proximity of roads. According to Barnes et al. (1991), elephants are attracted by secondary forests given the diversity of available food resources.

Past and present logging activity signs can be found all over the concession, apparently without significantly affecting the distribution of mammals. In Kibale Forest (Uganda), *C. monticola* seemed particularly affected by forest logging activities (Struhsaker, 1998) but this was not the case in our site. At Lopé (Gabon), densities of *Pan troglodytes* dropped about 20% after logging (WHITE, 1998). In our study site, where logging has been more or less continuous since the 50's, *Pan troglodytes* is still present and does not seem to avoid logged over areas.

Our study shows that mammal surveys carried out during routine forest inventories can be used to highlight the relationships between fauna, habitat and human activities. These results provide important recommendations for managers and help limit the negative impacts of logging activities on wildlife. The road network seems to be at the heart of the problem since hunting intensity is strongly correlated with distance to roads. An optimal planning of the road network limits the direct negative impacts while a better control of access limits commercial hunting activities.

The results of this study show that some common game species (mainly *Atherurus africanus* but also *C. monticola*) are resilient to human pressure such as habitat degradation or hunting. A sustainable hunting management plan could be considered for such species so as to satisfy local people's needs. On the other hand, for vulnerable species, such as *Pan troglodytes*, a monitoring program should ensure the maintenance of its diversity within the logging concessions.

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MANAGING PRODUCTION FORESTS FOR BIODIVERSITY

Zacharie Nzooch Dongmo¹, Leonard Usongo², Jeff Sayer³ and Eduardo Mansur⁴

Introduction

Tropical forests are of enormous importance for the conservation of the world's biodiversity. They contain more species than other biomes and a high proportion of these species are threatened. However, only about 12% of tropical forests are in protected areas and many of these are poorly managed (Lock and Dearden 2005). Nearly all of the remaining 90% of forests are subject to some form of extractive use or are destined for conversion to non-forest uses. A significant proportion of this 90% is, or is likely to be, subject to timber harvesting or to conversion to tree plantations. These managed production forests offer huge potential for biodiversity conservation (Meijaard et al. 2005). A recent IUCN Global Species Assessment states that "...for many species the habitat degradation that accompanies selective resource exploitation, or that occurs in habitats next to cleared areas, can have serious negative consequences". However, there is abundant evidence that logged forests can continue to make important contributions to biodiversity conservation objectives. A recent paper in the journal *Nature* (Meijaard and Sheil 2007) was entitled, "A logged forest in Borneo is better than none at all" and argued strongly for the role of logged forests in biodiversity conservation. Various categories of managed production forest are essential for the survival of many species of fauna and flora. Studies by FAO (1995) and IPGRI (2001) have also documented the need to manage tropical forests in ways that maintain the genetic diversity of their tree species.

Development of Guidelines

Development of Guidelines

Since 2004 the International Tropical Timber Organisation and the International Union for Conservation of Nature have been collaborating to elaborate Guidelines for the conservation of biological diversity in tropical production forests. The work involved ITTO members throughout the tropics but in this paper we will focus on the part of the study that took place in the rainforests of central Africa, and more particularly in Cameroon.

Cameroon has a distinguished history of practical measures to conserve forest biodiversity. Its forests are the home of significant populations of gorillas, chimpanzees, elephants and bongos – forest species of global conservation interest. But Cameroon's forests are also home to a high diversity of other primates and of birds. Cameroon now has the highest proportion of its tropical forests in national parks and wildlife reserves of any tropical country – but conservationists working in the field in Cameroon were quick to realize that for many species of wildlife the managed production forests were at least as important as the parks and reserves. Indeed, for gorillas and elephants studies have shown that the disturbance caused by selective logging favours a rich understory of gingers (*Zingiber spp*) and species of the arrowroot family (*Marantaceae*), which are favourite food sources of both gorillas and elephants (Morgan and Sanz 2007). Bongos and other forest antelopes also thrive in areas where logging has opened up the canopy and allowed the development of the rich undergrowth that provides them with shelter and food.

IUCN and ITTO worked closely with colleagues from the Worldwide Fund for Nature in Cameroon to study the ways in which logging operators could modify their practices in order to favour the maintenance of biodiversity in their concessions. Detailed studies of the numbers of elephants, bongos and primates were conducted both in the logging areas and in adjacent national parks (see Table 1).

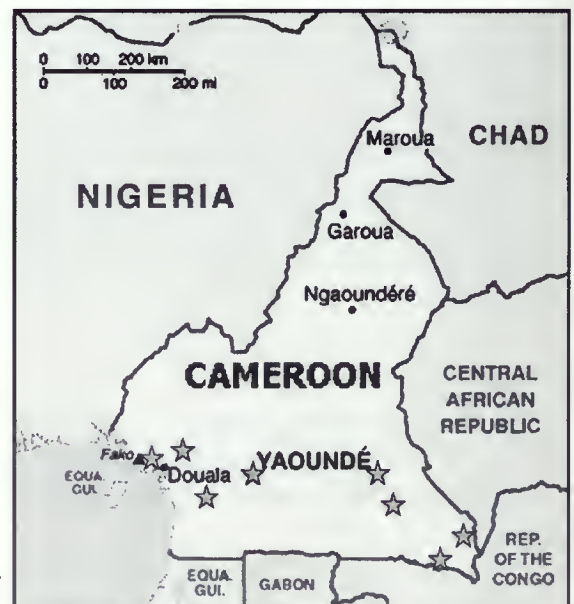


Figure 1. Sites in Cameroon where the draft guidelines were assessed.

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Table 1: Density of large mammal in National Parks and logging concessions in South East Cameroon.

Area	Site	Elephant	Gorilla	Chimpanze	Red Diuker	Blue Diuker	Source
National Park	Lobéké NP	0.96 [0.81-1.14]	1.59 [1.13-2.24]	0.51 [0.34-0.76]	11.4 [9.28 - 13.15]	3.12 [2.54-3.84]	Nzoooh (2003)
	Lobéké NP	1.15 [0.97-1.36]	2.27 [1.52-3.38]	0.68 [0.42-1.13]	15.51 [11.91 - 20.19]	6.52 [4.95 - 8.58]	Nzoooh et al 2006
	Boumba-Beck NP	0.2 ± 16	0.9 [0.7-1.1]	0.3 [0.2-0.4]			Ekobo (1998)
	Boumba-Beck NP	----	----	----	11.21 [7.04-17.88]	10.63 [6.09-18.53]	Bene Bene & Nzoooh (2005)
	Nki NP	0.75 [0.66-0.85]	4.64 [3.60 – 5.99]	0.392 [0.268-0.574]	6.78 [5.35 – 8.61]	2.78 [2 – 3.87]	Nzoooh et al 2006
Logging Concession	UFA 10-013	0.356 [0.212-0.6]	4.72 [2.79-7.98]	----	15.47 [8.18-29.24]	2.92 [1.62-5.27]	Nzoooh et al (2004)
	UFA 10-021	0.092 [0.036-0.232]	----	----	4.58 [3.03-6.93]	7.66 [5.72-10.25]	Nzoooh et al (2003)
	UFA 10-022	0.08 [0.04 – 0.16]	----	----	2.21 [1.32 – 3.70]	1.15 [0.53 – 2.48]	Nzoooh et al (2004)
	UFA 10-023	0.14 [0.11-0.17]	0.83 [0.33-2.13]	----	3.08 [2.07-4.59]	4.51 [2.71-7.52]	Nzoooh et al (2006)
	UFA 10-064	0.83 [0.65-1.05]	----	----	6.1 [4.34-8.58]	6.15 [3.45-10.95]	Nzoooh et al (2004)
	UFA 10-008	----	2.34 [1.32-4.15]	----	4.17 [3.14-5.54]	5.28 [4.19-6.65]	Nzoooh et al (2005)
	UFA 10-009	0.23 [0.16-0.33]	4.28 [2.72-6.74]	----	10.89 [8.46-14.01]	4.29 [2.88-6.39]	
	UFA 10-010	0.53 [0.33-0.86]	3.33 [1.77-6.27]	----	10.45 [7.21-15.14]	2.74 [1.63-4.59]	
	UFA 10-012	0.96 [0.65-1.42]	----	----	11.59 [8.17-16.44]	32.78 [24.81-43.31]	

The number in brackets [] is the 95 % confidence limit.

Surprisingly it was found that the logging areas and the protected areas had complementary roles in the maintenance of species populations. Many large mammals used different parts of the landscape at different periods of the year and moved freely from protected to logged-over areas. In the years following logging, populations of many species peaked in the regenerating forests. Disturbance was good for these species. Of course not all disturbances were beneficial. There is much anecdotal evidence that when logging infrastructure improves access for illegal hunters then considerable declines occur in the diversity and density of wild animal populations. The principal determinant of good outcomes is the quality of management by the concessionaire. Forests managed by companies who are striving for certification of their concessions and who take active measures to protect their forests during and after logging have more abundant and more diverse wildlife than those in forests of concessionaires who do not take any certification-related conservation measures.

Draft guidelines

The result of the work was the drafting of a set of Guidelines that are to be debated by the ITTO Council in November of 2008 (ITTO/IUCN *in press*). They propose the following as a set of best practice Guidelines which, if followed, would ensure that tropical production forests become a major resource for tropical biodiversity.

Table 2. Summary of the draft ITTO-IUCN Guidelines for the Conservation and Sustainable Use of Biodiversity in Tropical Timber Production Forests.

Principles	Guidelines
1: Sovereignty and societal choice	1: National, regional and local biodiversity strategies, plans and regulations that are based on national and local priorities should be reflected in the management of tropical production forests.
	2: Biodiversity goals and targets for tropical production forests should be developed with the involvement of all relevant stakeholders with particular attention to the needs and priorities of local communities.
2: International commitments	3: International commitments for the conservation of genes, populations, species and assemblages of species or habitats should be reflected in the legal and regulatory frameworks guiding the allocation and use of land for production forestry.
	4: Special measures will often be required when species and populations that are internationally recognized as rare, threatened or endangered occur in or adjacent to forest management areas.
3: Political commitment, policies and laws	5: The values of biodiversity as a global resource, a vital component of ecosystems, and a key element of local livelihoods should be demonstrated and communicated to all stakeholders, including decision-makers.
	6: Appropriate policies, laws and regulations should be developed and implemented to ensure that global and local biodiversity interests are adequately addressed in the management of tropical production forests.
4: Land use and spatial planning	7: National land-use planning processes and forest and environmental laws should explicitly address issues of biodiversity conservation in forests at all spatial scales.
	8: Inconsistent or contradictory land-use policies and laws at national and sub-national levels that conflict with biodiversity conservation or do not support SFM in general should be identified, reviewed and modified.
5: Decentralization, forest tenure and natural resource access rights	9: Local communities should have the right to use biodiversity to meet their economic and cultural needs and should be involved in its management and protection. Clearly demarcated and defined tenure and resource use rights might benefit biodiversity by providing local people with incentives for conservation.
	10: Arrangements regarding forest ownership and use at the landscape scale should be favourable for the conservation of forest biodiversity.
6: Incentives	11: Managers of tropical production forests should be compensated for the incremental costs of biodiversity conservation measures.
	12: Independent voluntary forest certification should encourage forest managers to conserve forest biodiversity, including by providing incentives.
	13: Subsidies and credits should be made available to offset the costs of biodiversity conservation in tropical production forests. Subsidies and credits that favour deforestation or forest degradation should be identified and progressively eliminated.
	14: Governments should make use of International payment/financial mechanisms to support and offset the incremental costs of conserving global biodiversity values and use these as an incentive to encourage biodiversity conservation in tropical production forests.
7: Knowledge, learning, technology transfer and capacity building	15: Relevant government agencies, forest managers, universities, research agencies and other organizations should collaborate in the development of systems for the collection, storage and processing of, and improved access to, existing and new data on biodiversity in tropical production forests.
	16: Governments, universities, research agencies and conservation NGOs should collaborate to produce manuals, guides and other material for communicating the underlying concepts, objectives and values of biodiversity in tropical production forests to forest managers and field personnel, key stakeholders and the media in language that is understandable, relevant and useful for all stakeholder groups.
	17: Biodiversity conservation in the complex ecological, social and economic settings that frequently characterize tropical production forests cannot be entirely rules-based and requires skills in adaptive management.
	18: The successful dissemination and uptake of innovative approaches to the conservation of biodiversity in tropical production forests requires alliances and partnerships between organizations with complementary knowledge and skills.
	19: Low-cost monitoring programs for biodiversity in tropical production forests that serve the needs of forest managers should be developed and conducted in ways that facilitate learning and adaptive management and that make information on achievements and failures widely available. Parataxonomists can provide valuable support to biodiversity assessment and monitoring.
	20: More capacity for biodiversity conservation in tropical production forests is needed in technical agencies, planning departments and timber companies and among local forest owners and managers.

8: Managing tropical production forests at a landscape scale	21: The management of different types of production and plantation forest within the larger landscape has a major influence on biodiversity in that landscape.
	22: The restoration of native vegetation on degraded sites should be planned to provide a diversity of successional vegetation types, increase the connectivity of forest patches, and allow the dispersal of plants and animals, thereby helping to ensure the viability of populations at landscape and forest management unit scales.
	23: Private and community forest owners need technical support to ensure that their activities are consistent with biodiversity conservation objectives.
9: Biodiversity considerations at the management unit level	24: Biodiversity should be given a prominent place at all stages of the preparation and implementation of forest management plans.
	25: All forest management activities affect biodiversity. Forest management must ensure that changes do not impact negatively on biodiversity features identified as having special value.
	26: Forest management plans should include information on the presence and conservation status of plants, animals and habitats of special conservation concern.
	27: Actual, potential and emerging threats to biodiversity must be anticipated and contingency plans prepared to ensure that, when needed, technically sound responses can be put rapidly into place.
	28: Biodiversity conservation objectives should be clearly and explicitly identified for each area of forest under management. These objectives should recognize and reflect the biodiversity values and possible trade-offs amongst key stakeholders, including local communities.
	29: The preparation of harvesting plans, including stock maps at the compartment level, should take into consideration the local occurrence of species or habitats of special conservation concern.
	30: Reduced impact logging should be used in tropical production forests.
	31: Special precautionary measures are required to protect populations, and maintain the within-species variability, of the most valuable timber species.
	32: Hollow trees, although generally of low commercial value, should be retained, as they provide important habitats for a wide range of animal species.
	33: Unnecessary nutrient losses from the forest ecosystem and impacts on soils should be minimized.
	34: Disruption of canopy cover might be important in allowing the regeneration of light-demanding species but this should be balanced by the need to retain canopy connectivity for canopy-dwelling animals and to reduce fire risk and the exposure of open ground to rain and sun.
	35: Forestry operations can encourage the introduction and spread of invasive alien species and measures should be taken to minimize this risk.
	36: Measures should be taken to avoid unsustainable levels of hunting and the gathering of NTFPs.
	37: Forest managers and other stakeholders should take special measures to mitigate increases in human-wildlife conflicts that might arise from logging activities.
10: Biodiversity conservation in planted forests	38: Planted forest establishment should focus on previously deforested or other degraded sites and not replace natural forest habitats of conservation concern.
	39: Large-scale planted forests can provide a forest matrix within which areas of high conservation value can be protected and managed.
	40: Management systems that favour natural processes and native species and enhance the productivity and resilience of the planted forest should be developed.
	41: The use of native tree species and species mixes in planted forests enhances the biodiversity value of the stand. When exotic species must be used, choose those which provide the best habitat for native biodiversity.
	42: Measures should be taken to ensure that plantation forestry does not facilitate the introduction of invasive species, which could impact negatively on both the planted forest and neighbouring natural forests.
11: Maintaining functioning forest ecosystems	43: Ecological knowledge should be Improved and applied to ensure that forest management enhances or maintains biodiversity and thus ensures forest functions such as pollination, seed dispersal and nutrient cycling. The ecology and habitat requirements of species of both commercial and conservation concern need to be understood and addressed in forest management planning.
	44: Special management consideration should be given to species that are strongly interactive or play a key role in the ecology of other species or have important influences on the overall ecology of a forest and the survival of other species.
	45: Particular sites and areas of forest and other habitats that provide important ecological functions should be identified and special measures taken to ensure their protection.
	46: The fire ecology and fire susceptibility of tropical production forests should be understood and biodiversity considerations included in fire management measures.

Discussion

The Guidelines alone will not solve all of the problems. There has to be commitment on the part of all the organisations and individuals whose decisions determine how forests are exploited and managed. The Guidelines address this by stressing the need for political commitment, dissemination of information

and the provision of incentives to loggers. A separate section of Guidelines addresses the issue of the costs and benefits of adopting more biodiversity- friendly logging practices. IUCN and ITTO will now collaborate to help timber companies and governments in the tropics to apply the Guidelines on the ground. Training will be provided and these organizations hope to sponsor pilot projects to help motivated companies to improve biodiversity conservation in their forests.

As climate changes and pressures for conversion of forests to industrial crops and biofuels increase the need to manage our remaining forests to enable them to resist new pressures will increase. Retaining the fullest possible range of species and genes will increase the chances that forests will be resilient to new climates and other pressures. Biodiversity will therefore help ensure that forests continue to provide the full range of environmental services and economic benefits that societies need.

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Sustainable Forest Management: The Experience of Tayna Nature Reserve in the Democratic Republic of Congo

Jacques VAGHENI KAKULE

Summary

This article presents the strategy used by the management of the Tayna Nature Reserve (TNR) in conserving Tayna's forest and fauna which is part of the Congo Basin forest ecosystem.

The method of analysis is based on the participation of local communities in every step of the creation and management of this protected area with the aim of fostering good relationships between the reserve and the community.

In the Democratic Republic of Congo, protected areas have been created and administered without the participation of the population. This situation generated an atmosphere of mistrust on the part of the communities towards protected areas which they consider to be the business of the State. This position led to sabotage, poaching and degradation of these areas due to agricultural activities. The method suggested by the TNR attempts to get round this obstacle.

This article calls for the democratization and liberalization of the management of the environment with the view of increasing initiatives for the safeguarding of forests and wildlife and reducing conflicts with neighboring communities over the protected areas.

Key words: Tayna Nature Reserve, participatory community conservation, dialogue committee.

INTRODUCTION

Sustainable forest management remains an important global issue since several ecological processes facilitating life on earth depend on forests. To that effect, the Congolese government aims at increasing the surface area of protected areas to at least 15% of the total national territory (2,345,000 square meters) (see Art. 14 of the Forest Code of the Democratic Republic of Congo (DRC), or Law No. 011/2002 of 29 August 2002).

Forest ecosystems deserve particular attention as they are home to the largest population of plant and animal species. Tropical forests host about 90 % of all terrestrial species (PNUE, 2000).

The Tayna Nature Reserve (TNR) is a showcase of experience in forest management regardless of the level of integration of the wildlife component. TNR covers a part of the Congo Basin forest considered by some authors as one of the largest 'lungs' of the planet. Mankoto and Armand (1992) wrote the following about this forest biome: 'Fauna and flora are of valuable interest for science, and the destruction of forests which represent the main source of genetic resources, is a growing concern for humankind'.

Tayna Nature Reserve is located on the Lubero territory, North Kivu province in the Democratic Republic of Congo. In the course of prospection, patrols and monitoring activities, researchers recorded: 23 gorilla families, 733 chimpanzees sites, 24 for elephants and 78 for buffalos (UGADEC, 2007).

The Reserve was established in the context of armed conflicts: several armed groups, national and foreign, uncontrolled by the government have been active in the area since 1996.

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The strategy used in creating and managing that reserve advocates for the coexistence in the same ecosystem of wild animals, plants and humans. The human-forest relationships are the target of all procedures of nature conservation in TNR. This ideal concept is promoted in TNR instead of attempting to suppress it, as is the case in national park systems where forceful methods are used to keep neighboring communities from enjoying certain rights of the area protected by the public service.

This method could contribute in avoiding human-protected area conflicts in most of the National parks in the DRC. Thus, there is a need to recommend it to those desiring to contribute to the global efforts being made to save the web of life.

This article aims to enrich the debate on forest and wildlife protection, and to express support for sustainable nature management through a sensitization of the community. It also strives to contribute to research and to promote solutions to problems related to the destruction of forests and its fauna.

METHODOLOGY

The methodology used is mainly bibliographic. To that effect, the author consulted monographs on TNR, activity reports of TNR and publications related to the management of the protected area.

The author and a team of field workers conducted interviews with the administrators of the reserve and a few local residents in order to double check the facts.

RESULTS

The Tayna Nature Reserve is a product of community efforts

The UGADEC Journal (Union of Associations for Gorilla Conservation and Community Development in Eastern DRC), alluding to the creation of the former Tayna Gorilla Reserve now renamed Tayna Nature Reserve, remarked that 'Awareness of the danger (of losing the whole forest) was born in the region'. Consultations started among landowners and their families with the aim of participating in the conservation of their own ecosystems to ward off the danger of extinction of faunal and floral species in their forests. The Chieftancy then took over with the Mwami Stuka and Mwami Mukosasenge, chiefs of the Batangis and of the Bamates respectively, with the technical support of their son Pierre Kakule. They initiated the idea of creating the Tayna Gorilla Reserve in 1998.

The customary chiefs who owned lands, together with local leaders and the intelligentsia, agreed to allocate a surface area of 850 square kilometers to the new reserve. The particularity of that initiative is the introduction of the concept of community and participative conservation that avoids any violent and traumatic action against indigenous populations in accordance with the respect of indigenous populations' rights in conservation areas (Kakule, 2004).

The objective in creating this protected area is to introduce the notion of conservation to populations. The specific objectives aim at protecting rare and threatened species (particularly the lowland gorilla), promoting development in the area, transforming the reserve into a natural laboratory and advocating ecotourism (Kakule, 2002).

Fauna and flora protected at the Tayna Nature Reserve

The census revealed that the conservation area hosts at least 16 primate species, 80 other mammals including the forest elephant, the buffalo, the leopard and the okapi. Birds such as the grey parrot, the great black-casqued hornbill and the great blue turaco can also be found at the TNR. Of all species, the lowland gorilla (*Gorilla beringei graueri*) remains the flagship species of the protected area, hence its

original name 'Tayna Gorilla Reserve'. Apart from the gorilla, other primates found include the chimpanzee (*Pan troglodytes*), the *Cercopithecus hamlyni*, the *Cercopithecus ascanius*, etc. The TNR is home to a significant quantity of halieutic resources. Its watercourses, like the Tayna, host many fish species yet to be identified (UGADEC, 2006).

The surface area to be protected includes the following biotopes:

- 15% of primary forest at low altitude
 - 32 % of primary forest at medium altitude
 - 41% of high primary forest
 - 12% of surface cleared by farmers
- (Kakule, 2004).

Ongoing research activities on the reserve's biodiversity will keep revealing its richness through the ecological initiatives implemented by the Tayna Center for Conservation Biology/University for the Conservation of Nature and Development in Kasugho (TCCB/UCNDK).

The Impact of the TNR in DRC

In 2002, in the wake of the TNR, many nature conservation associations were created. They are: Punia Gorilla Reserve (RGPU), Primates and Lowa Forest Community Reserve (RECOPRIFOL), Community conservation for Bakano Forest Reserve (COCREFOBA), Usala Gorilla Reserve (RGU), Bakumbule Primates Community Reserve (RECOPRIBA), Utunda and Wassa Gorilla Reserve (REGOUWA), Lubutu Gorilla Reserve (REGOLU).

All these associations have agreed to cooperate under the leadership of the TNR. They formed the Union of Associations for Gorilla Conservation and Community Development in Eastern DRC (UGADEC). The surface area preserved by this platform constitutes an important ecologic corridor between the Maiko national park and the Kahuzi Biega park. UGADEC is operational in the North Kivu, South Kivu and Maniema provinces, however its philosophy is gradually spreading to the Equator and Kasai provinces and elsewhere. (UGADEC, 2007).

The effectiveness of Participatory Forest Management method

The example of the TNR in sustainable forest management using a system that safeguards wildlife is based on dialogue between local populations and the direct managers of the reserve. While national parks are facing conflicts with populations, the TNR is establishing itself, gaining the trust of local residents who willingly accepted to give away their lands and support the project psychologically and physically. Ten years after its creation, researchers who show interest in this reserve unfailingly acknowledge its success against all odds. In 2006, a student named Kikere assessed, as part of his final project work, the 'effectiveness of the community-based conservation strategy: Case of the Tayna gorilla reserve' (Kikere, 2006). Using a questionnaire-based methodology, he concluded that the sustainability of the initiative was dependent on its ability to cooperate with local populations during the creation of the TNR and at the different stages of its development. He also noted that the success of the reserve depends on the sustained dialogue between stakeholders (populations and TNR managers) and the transparent management of the benefits of the project. This would enable the project to avoid the mistake made by national parks where forceful conservation methods are used.

The author and the TNR management have made attempts to understand this situation in detail. Interviews conducted with the reserve manager, Pierre Kakule, on the one hand, and customary chiefs on the other hand, revealed the following elements that possibly account for the success of the TNR.

A harmonious creation

From the onset, nothing was imposed on the local population who willingly welcomed the team of extension agents. Agreements were concluded without any coercion and the populations accepted to allocate their lands to the wildlife conservation project.

The local population enjoy benefits generated by the managed forest

When creating the TNR, emphasis was put on the difference between the concepts of nature protection and nature conservation. While the first concept implies maintenance with no human intervention, the second considers that nature should be managed by and for man.

Through the community participatory management strategy, the TNR has opted for the conservation of species. Following a scientific census, a list of species to be protected was drawn. Taking into consideration the livelihoods of the local resident populations, majority of whom are part-time hunters, agreements were designed to recognize that small mammals would be excluded from the restriction. Hunting for food is also allowed even though it is regulated by the local customary law.

The zoning system contributes to the materialization of this convention with little damage to the preserved forest. Human activities are prohibited within the integral zone as this is the place where the density of animals is higher and where they reproduce, etc. In the buffer zone, local people are allowed to collect firewood and hunt so long as they respect protected species. In the development zone, populations engage in their normal activities including building schools, hospitals, etc. These three zones form the Tayna Nature Reserve.

Creation of dialogue committees

Dialogue committees were created to link the TNR and populations. They represent the population during demarcation operations, offer local labour at stations within the reserve, draw the list of needs for the population and prioritize them. They are in charge of teaching mesology to the locals with the aim of encouraging them to become and remain friends of nature.

Recruitment of local labour

Hiring locals in conservation stations for positions they possess the abilities for, is preferred. Thus, more than 90% of trackers are the sons of chiefs landowners. The advantage of this situation is that these young people conserve a forest they know very well, making it easy to monitor and patrol in the search for poachers. This policy helps locals to understand that conservation is for their benefit.

Development projects

To succeed in its development-related community conservation strategy, the TNR creates primary and secondary schools, health centers, orphanages, and provides technical and material support to local development initiatives. The creation of the University for the Conservation of nature and development in Kasugho mentioned above, is part of the framework for the training of environmental technical managers for the project in particular and for the country in general. Young people originating from conservation areas all over DRC enjoy scholarships in that institution thanks to the funding from Diane Fossey Gorilla Fund International (DFGFI) and Conservation International (CI).

DISCUSSION

There is no need to drive out populations to effectively manage forest and its wildlife. This is the contribution of TNR to the exchange of experiences. Nature conservation based on community participation can be viewed as the best way of managing forests in a rational manner. 'It is obvious that the survival of a protected area is dependent on the attitude of local populations and public support' (Forest people project, 2002).

To succeed, the creators of the TNR considered observations made by Rose in her book *La nature dévorée* (Nature devoured): 'Conservation actions should be integrated into development priorities' (Rose *et al.*, 2004).

PNUE, 2000 made the following remark in *L'avenir de l'environnement mondial* (the future of world environment): 'When populations are allowed to participate in the analysis of resources issues and possibilities, they are better informed and aware of factors affecting their daily life.' Tanya populations will continue to support conservation efforts as long as they benefit from them.

Even though the poaching issue is among the difficult problems to be solved in the management of protected areas all over the world, for the time being, there is a need to trust the community-based conservation strategy because a population that benefits from managing a protected area will not take the chance of destroying it.

CONCLUSION

In this article we endeavoured to present the experience of the Tayna Nature Reserve (TNR) in the framework of managing the forest and its fauna. Data made available to the author testify to the way TNR organization was able to avoid conflicts between neighboring populations and a protected area.

However, it is worth noting that the participatory method remains a cumbersome system as it necessitates too many consultations prior to making key decisions. It also requires a large and often costly continuous awareness and sensitization programme. The method is equally difficult to implement in a country where lands are managed under the Customary Right system as opposed to the Public Right. Generally, the land does not belong to only one person, it belongs to a family or a clan. Being able to convince all the beneficiaries for a conservation project requires proven leadership skills.

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ESTIMATED MINIMUM AND MAXIMUM SUSTAINABLE EXPLOITATION VALUES FOR DERBY ELAND AND OTHER BIG GAME IN BENOUE NATIONAL PARK CAMEROON

Tsi Evaristus Angwafo¹, Ajaga Nji², Mpoame Mbida³ and Gehard Wiegler⁴

Summary

Bio-indicators (density, encounter rate and abundance rate) and monetary valuation were used to determine quantitative and qualitative information of Derby Eland (*Taurotragus derbianus gigas*) and other big games in the Benoué National Park (BNP) in Cameroon. This information is needed in the design of useful proposals to safeguard and sustain the Derby Eland for conservation and management. Dry season inventory was carried out using the line transect method and direct and indirect observations. The density of Derby Eland was 0.85 animals/ km² in BNP. The total biomass of the animals (big games), percentage contribution of the Derby Eland and the biomass per hectare for Derby Eland is 22860 kg, 6.65% and 12.7 kg/ha in BNP. The estimated value of Derby Eland in monetary terms was US \$ 107590.95 in BNP. Big games particularly species of major interest to tourist are still present in BNP with great financial potential even though appropriate action needs to be taken at the legal, ecological, economic and social levels to safeguard sustainability of resources.

Key Words

Bio-indicators, Derby Eland, Big games, Threshold values

INTRODUCTION

Protected areas like the Benoué National Park (BNP) in Cameroon with its available big games can aid the consumptive utilization (protein source and socio-culturally), sustainable tourism (sport hunting, game watching, and trophies), and contributes immensely to the economy of the country at the community and national levels. Exploitation of these animals therefore needs to be sustainable and requires adequate survey information

Despite the fact that the concept of sustainable use and incentive-based conservation were promoted by International Union for the Conservation of Nature (IUCN) and many other organizations, there is a lack of detailed quantitative information on Derby Eland and other big games in the Benoué National Parks Cameroon. The objective of this study is threefold: (i) to identify and quantify the Derby Eland and other big games found in Benoué National Park; (ii) to determine their financial potential vis a vis tourism; and (iii) to establish the maximum and minimum exploitation values for these big games.

STUDY AREA

Benoué National Park (longitude 13° 34'-14° 01' and 7° 55'-8° 55') has a surface area of 18 km², and lies in the savannah belt. BNP was created by the decision order No 120 of 5th November 1968 by the Secretary of State for Rural Development of the Republic of Cameroon. It was formally a game reserve created by decision orders No 351 of 18th November, 1932 by the French Commissioner in Cameroon. Benoué was designated a biosphere reserve by the department for ecological sciences of UNESCO in 1981 (UNESCO, 1989).

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This park is situated in the plains of Benoué river at the foot of the Adamaoua plateau. The dry season when grasses have dried up, the vegetation is more open. BNP experiences 5 months of rain and 7 months of dry season. Mean annual temperature is 24°C and annual precipitation is around 1000 mm. December is the coldest month (min: 13°C-max: 32°C) and April the hottest (min: 23°C-max: 36°C). Soils are granites in the south west of Adamawa. Benoué lies on sedimentary soils as plains in the South/East are littered by inselbergs and small hills. The vegetation is composed of *Isobertia doka*, *Burkea africana*, *Anogeissus leiocarpus*, *Terminalia macroptera*, *Isobertia daljellii*. Dominant trees include: *Azadirachta africana*, *Borreria africana*, *Butyrospermum parkii*, *Daniella oliveri*, *Monotes* spp., *Uapaca detarium*, *Vitex doniana*, *Lophira lanceolata*, *Parkia biglobosa*, *Boswellia* spp., *Prosopis africana*, *Sterculia setigera*, *Cassia sieberana*, *Kigelia africana*, *Ziziphus* spp., *Piliostigma thonningii*, *Pterocarpus erinaceus* with 260 species of superior vegetation species identified. Benoué National Park is situated just off the Ngaoundere-Garoua main road.

with rich fauna, including populations of buffalo, hippopotamus, crocodiles, hyenas, giraffes, panthers, lions and a variety of primates. The park can be visited all year round. Of the 28 hunting zones in the north of Cameroon 8, belong to the Benoué National Park, 2 of which have been given to private operators.

METHOD

Inventory of Derby Elands and other big games was done during the dry season in the months of January to April 2005. The method used was that of walk (counting while walking on foot the species dung along a line transect) and direct observation of the animal (Hochachka, 2000). Line transects were marked out using prepared geographical information systems (GIS) maps of the BNP at intervals of 7km, and length of 500m interspersed by rocky transects of 1500m. The estimate of encounter rate which is a bio-indicator of the frequency with which a game watcher or sharp shooter will easily come in contact with the species while covering a specific distance was measured with the kilometric index (KI), KI is got by dividing the number of directly observed species by the total distance covered. As a general rule when the kilometric index of abundance (IKA) is less than 0.3 – it is weak; between 0.3 and 0.5 – average and greater than 0.5 – high (based on sufficient frequency contact with animals) Vincent et al. (1991).

The average weight of animals' species is calculated from standard weights of male and female. An average weight multiplied by the number of animal species observed gives the biomass. The total biomass of all big game species is calculated as well as percentage contribution by each species to the total biomass. Therefore, the biomass per hectare can be determined since the total surface area of BNP is known.

The annual monetary (US \$) value was projected by multiplying four months revenue estimated during the study period by a factor of 3. These estimates made use of the populations of animals observed directly multiplied by the cost of harvesting or shooting one animal species by sport hunters stipulations in the text and certificate (Delegation of the Ministry of Environment and Forestry (MINEF) Garoua, Cameroon (2005))

RESULTS

The density of Derby Eland was found as 0.85 animals/ km² in Benoué National Park. Below is the GIS map of BNP showing the distribution of Derby Eland as Figure 1; while Table 1, shows the encounter rate of Derby Eland and other big games observed directly in Benoué National Park. IKA is a bio-indicator index to characterize the abundance of animal population.

Table 1: Encounter rate of Derby Eland and other big games in Benoue National Park.

Species	Number of animals Observations	Distance of transect walked (Km)	IKA (km ²)
<i>Taurotragus derbi anus</i>	45	69	0.65
<i>Alcelaphus buselaphus</i>	00	69	-
<i>Kobus kob</i>	01	69	0.01
<i>Syncerus cafer</i>	00	69	-
<i>Loxodonta africana</i>	60	69	0.87
<i>Ourebia ourebi</i>	04	69	0.06
<i>Panthera leo</i>	00	69	-
<i>Panthera pardis</i>	00	69	-
<i>Crocuta crocuta</i>	00	69	-
<i>Giraffa camelopardalis</i>	02	69	0.03
<i>Potamochoerus africanus</i>	11	69	0.1

The total animal biomass, percentage contribution and biomass per hectare for Derby Eland and other big game in Benoué National Park was calculated (see Table 2).

Species	Average weight (AW)	Observ. (O)	Total Biomass AW * O	Contribution to Total Biomass (%)	Biomass (kg/ha)
<i>Taurotragus derbianus</i>	800	45	22860	6.65	12.7
<i>Alcelaphus buselaphus</i>	160	00	-	-	
<i>Kobus kob</i>	70	01	70	0.02	0.04
<i>Ourebia ourebi</i>	20	04	80	0.02	0.04
<i>Loxodonta africana</i>	5300	60	318000	92.58	176.67
<i>Potamochoerus africanus</i>	80	11	880	0.26	0.49
<i>Giraffa camelopardalis</i>	800	02	1600	0.47	0.89
Total	7,250	123	343,490	100	190.83

Table 2: Estimated biomass, of some big game in Benoue National Park (1,800 ha)

AW = weight of male plus weight of female divided by 2

O = Number of observed animals

AW * O = AW multiplied by O

The total biomass, percentage contribution and biomass per hectare for Derby Eland is 22860, 6.65% and 12.7 in Benoué National Park. Calculated values for the biomass can be compared with standard values to determine the threshold at which wildlife species are at maximum sustainable yield (MSY) or at minimum sustainable yield in a National Park. Maximum biomass of wildlife at maximum sustainable yield (MSY) is 0.22 or about 35% of the biomass at maximum sustainable yield (BMSY) level. Minimum Biomass threshold is ½ BMSY (Mid-Atlantic Fishery Management Council, last date of access 20/12/2005).

An estimate of the population and the worth in monetary terms of Derby Eland and other Big Game in BNP was calculated. The Derby Eland population in Benoué National Park is 45 animals which are estimated at a unit value of US \$ 2,390.91 (cost of harvesting or shooting one Derby Eland species by a sport hunter according to the stipulations in the text (Delegation MINEF Garoua, (2005) gives a value of US \$ 784,253.34. Table 3 below shows the estimated economic value for some big game in Benoue Natioanl Park.

Table 3: Estimated economic value from Big Game in Benoue National Park from January - May 2005

Animal Species	Estimated Number	Unit Value (US \$)	Estimated Value (US \$)
<i>Taurotragus derbianus</i>	45	2,390.91	107590.95
<i>Alcelaphus buselaphus</i>	00	636.36	00
<i>Kobus kob</i>	01	366.64	363.64
<i>Ourebia ourebi</i>	04	181.82	727.28
<i>Loxodonta africana</i>	60	2,390.91	143,454.1
<i>Potamochoerus africanus</i>	11	409.09	4,499.99
<i>Giraffa camelopardalis</i>	02	2,390.91	4,781.82
Total	123		261,417.78
Annual Total			261,417.78 * 3 = 784,253.34

US \$ 1 = 550 F CFA
Total annual worth of the park in Derby Eland and other Big game = US \$ 933,572.01. Percentage annual revenue contribution from Derby Eland = 13.72%

DISCUSSION

The density (the number of animals per unit area uniformly distributed in space) of big games in Benoué National Park is generally low. From the epidemiological point of view, the low presence presents fewer risks for the big game provided, however, that the density levels of all the other species in the Park at any one time are held constant. Such a density also assumes there is no migration of big game from one Park to another. Furthermore, low animal population densities, especially for endangered species improve the chances of their survival as this allows for a steady and convenient protection of the ecosystem through natural vegetation and regeneration. Such a situation is beneficial to the Benoué National Park which is located in the semi arid region where the big games do not benefit from professional maintenance.

The biomass estimate of Derby Eland in Benoué National Park is high 12.7 kg/ km². Derby Elands are secondary consumers and in the food chain are at a high trophic level. Going by the general assumption that, the biomass of each trophic level decreases as the trophic level increases, this higher biomass can be an indication that the primary producers on which the Derby Eland depends are more or less thriving well in BNP probably during the period of this study. Previous research by Tsague (1994), WWF (1998), Stark (1986) and Assan and Mahop (2000) report the same trend in the density and biomass of Derby Eland in Benoué. Such results could serve as a wake up call for better big game management. The disparity in the results may be attributed to the absence of observation of certain herbivores like the hippopotamus and buffalo which contributed significantly in the estimates of the previous authors which were not included in the present study. Moreover, the total surface area covered during the census, the timing and location are different. In this study a greater biomass contribution in terms of total percentage came from the Elephant (92.58%) and Derby Eland (6.65%). All these species feed and live in a flock or herd migrating locally from one park to another influenced by anthropogenic disturbance in the system (fire, poaching, sport hunting).

The abundance of animal species in the Benoué National Park is 0.65 (high). This shows that there is a

higher chance of coming in contact with Derby Elands in Benoué walking a short distance. When the chances of finding a Derby Eland in the Park become continuously slimmer, it distresses Derby Eland lovers, making it imperative for the management to find innovative ways to conserve and expand the species. There is urgent need for sustainable management practices to ensure availability of the big games for future generations.

The value of big games in monetary terms is a measure of the importance that ought to be attached to their conservation. This is consistent with the concept that the higher the value of a resource, the more attention will be given to its conservation. Considering that the ultimate goal of conservation is to improve environmental health as well as the welfare of human and wildlife communities, hence determining the socioeconomic benefits accruing from big games is important. Sustainable big game tourism industry can be big national income earner where appropriate institutions and policies exist (Ajaga Nji 1989). Coupled with efficient management, the wildlife sector can boost tourism to a second position after petroleum as a source of foreign earning in most countries. It must be recalled that the estimated annual worth of the monetary value of big game in Benoué National Park stands at US \$ 933,572.01 with the Derby Eland contributing 14.09% in 2006. This suggests that the sector has the potential to contribute significantly to national revenue if appropriate conservation and promotion measures are put in place. The results obtained by this study point to tourism in Benoue National Park as one of the avenues that Cameroon could take to extricate itself from the club of Heavily Indebted Poor Countries.

CONCLUSIONS

This study reveals that big games, such as the Derby Eland, which are species of major interest to tourists, are still present in Benoue National Park (BNP). It also shows that big games have great financial potential as an income earner and could serve as a sustainable basis upon which to build anti poverty programs linked to tourism. The Derby Eland populations in Benoue National Park over the years to the present indicate that the ecological systems prevailing therein are still capable of permitting big games to thrive.

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Conservation and sustainable use of wildlife -based resources through the framework of the Convention on Biological Diversity (CBD) : The Bushmeat Crisis

Tim Christophersen¹ and Robert Nasi²

Summary

This article presents a number of policy recommendations to improve the sustainability of wildlife-based resources use in tropical forests, including by strengthening national ownership of this issue in a way that provides long-term local and national benefits. It also argues in favour of stronger involvement of civil society and the private sector in addressing governance issues and other aspects of current overexploitation of wildlife; enhancing local ownership rights; and establishing links between the bushmeat debate and tenurial and land-rights reform. At the international level, the authors suggest that trade relations between developed and developing countries, which (directly and indirectly) affect bushmeat consumption levels, must be seriously reconsidered, and that efforts should place a stronger emphasis on positive incentives for better managing wildlife resources.

Bushmeat in the framework of the CBD

The Convention on Biological Diversity (CBD) recognizes the importance of the conservation and sustainable use of bushmeat in several decisions of the Conference of the Parties (COP). The CBD programme of work on forest biodiversity, adopted on 2002 and reviewed in 2008, contains the goal to prevent biodiversity losses caused by unsustainable harvesting of timber and non-timber forest resources, including bushmeat. In 2002, the CBD also established a liaison group with a focus on bringing harvesting of non-timber forest products (NTFPs), particularly bushmeat, to sustainable levels. This group was involved in developing the CBD Technical Series publication Conservation and Use of Wildlife Based Resources: The Bushmeat Crisis, which is the basis for this article.

The ninth meeting of the COP, 19-30 May 2008 in Bonn, Germany, furthermore urged Parties to the CBD to address, as a matter of priority, major human-induced threats to forest biodiversity, including unsustainable hunting and trade of bushmeat, and their impacts on non-target species.

Wildlife and livelihoods

Rural people, moving from a subsistence lifestyle to a cash economy, and without access to capital, land or livestock, have relatively few options for generating income. They can sell agricultural or pastoral produce, work for a cash wage in agriculture or industry, or sell retail goods in local or regional marketplaces. However, the harvesting of wildlife resources often offers the best return for labour input in the short-term.

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³ This article is a summary of the CBD Technical Series publication "Conservation and Use of Wildlife Based Resources: The Bushmeat Crisis" (Nasi et al., 2008), published by the Centre for International Forestry Research (CIFOR), the Wildlife Conservation Society (WCS), the Overseas Development Institute (ODI), and the Secretariat of the Convention on Biological Diversity (CBD) in 2008. The full document is available electronically at www.cbd.int, and can be ordered free of charge in hard copy at: secretariat@cbd.int, or CBD Secretariat, 413 rue St. Jacques W., Suite 800, Montreal, QC, H2Y 1N9, Quebec, Canada

⁴ Bushmeat is defined in this article as any non-domesticated terrestrial mammals, birds, reptiles and amphibians harvested for food. While insects and other invertebrates can be locally and seasonally important dietary items, it is the larger vertebrates which constitute the majority of the terrestrial wild animal biomass consumed by humans. The article therefore focuses on terrestrial vertebrates, but makes reference to the indirect links between harvesting of fish to the consumption levels of bushmeat.

⁵ Decision VI/22, Annex, revised by decision IX/5 – see www.cbd.int

Indeed, recent data suggests that the use of wildlife is important to local livelihoods and serves multiple roles. Estimates of the national value of the bushmeat trade range from US\$ 42 to 205 million across countries in West and Central Africa (Davies, 2002). Wildlife products are often major items of consumption or display and have high medicinal and spiritual values in many cultures (Scoones et al., 1992). Bushmeat, in particular, offers a number of benefits to forest-dwelling populations. It is an easily traded resource as it is transportable, has a high value/weight ratio and is easily and cheaply preserved. It often represents both the primary source of animal protein and the main cash-earning commodity for the inhabitants of the humid forest regions of the tropics. Throughout tropical forest countries, many people benefit from wild meat: from those who eat it as part of a forest-dependent subsistence lifestyle, to those who trade and transport it at all points along different supply chains, to those who consume it in restaurants and homes, often far from the forest.

The bushmeat crisis

The increase in population density in many forested areas, as well as persistent problems with the affordable supply of substitute sources of protein, have increased off-take levels, often beyond sustainable levels (Bennett and Robinson, 2000). A review of the literature addressing the sustainability of hunting in tropical forests was compiled by comparing estimated productivity and off-take rates. From Table 1 it can be seen that, in general, hunting appears to be unsustainable. This means that many bushmeat species are being harvested at levels beyond their reproductive rates, which might lead to the collapse of populations and the possible extinction of species. The bushmeat crisis could have considerable socio-economic effects, in addition to the potential damage to ecosystems, and the cultural, moral, spiritual, and emotional loss that extirpations (local extinctions) or global extinctions of species represent for humankind.

Table 1: Sustainability of hunting

Country	Reason for hunting	Estimated sustainability ^a	Reference
Bolivia	Subsistence	50 (10)	Townsend, 2000
Cameroon	Subsistence / trade	100 (2)	Fimbel et al., 2000
Cameroon	Subsistence / trade	No	Infield, 1998
Cameroon	Subsistence / trade	50-100 (6)	Delvingt et al., 2001
C. A. R.	Subsistence / trade	100 (4)	Noss, 2000
Côte d'Ivoire	Trade / subsistence	100 (2)	Hofmann et al., 1999
DRC	Subsistence	Yes	Hart, 2000
DRC	Subsistence / trade	Yes	De Merode et al., 2003
Ecuador	Subsistence	30 (10)	Mena et al, 2000
Eq. Guinea Bioko	Subsistence / trade	30.7 (16)	Fa, 2000
Eq. Guinea (Rio Muni)	Trade	36 (14)	Fa and Garcia Yuste , 2001
Eq. Guinea (Rio Muni)	Trade	12 (17)	Fa et al., 1995
Ghana	Trade / subsistence	0 (2)	Hofmann et al., 1999
Ghana	Trade	47(15)	Cowlshaw et al., 2004
Indonesia (Sulawesi)	Subsistence / trade	66.7 (6)	O'Brien and Kinnaird, 2000
Indonesia (Sulawesi)	Subsistence / trade	75 (4)	Lee, 2000
Kenya	Subsistence / some trade	42.9 (7)	FitzGibbon et al., 2000
Paraguay	Subsistence	0 (7)	Hill and Padwe, 2000
Peru	Subsistence / trade	Yes	Bodmer et al., 1994
Peru	Subsistence / trade	No	Bodmer et al., 1994
Peru	Subsistence	0 (2)	Hurtado-Gonzales and Bodmer, 2004

^a Estimated sustainability: % of species unsustainably hunted (number of species studied)
Yes /No when the above information was not available in the reference
Modified from Bennett and Robinson (2000)

⁶ Sustainable use is defined in Article 2 of the Convention on Biological Diversity as: “The use of components of biological diversity in a way and at a rate that does not lead to the long -term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations.”

The sustainability of bushmeat harvesting is, in many cases, influenced by external factors, such as inappropriate policies and governance; demography; increased commercialization of the wildlife harvest; fragmentation and land-use changes; logging and other resource extraction activities; and developments in the agricultural sector (Nasi et al., 2008). There appears to be no easy solution to this complex problem. However, some policy recommendations for the consideration of decision-makers at the appropriate levels are outlined below.

Recommendations for improving the sustainability of bushmeat hunting

The bushmeat crisis is first and foremost a problem resulting from an unmanaged common resource being unsustainably harvested because of inadequate governance and policy frameworks. Many of the underlying causes of the unsustainable use of wildlife are the same as those underlying poverty and sustainable livelihoods. As such, the problem should be addressed in the broader framework of sustainable natural resource management, and build on lessons learnt in the framework of sustainable forest management (SFM), and other relevant policies and management regimes. Approaches to address the bushmeat crisis should be nation-, site- and context-specific, based on a detailed knowledge of hunting patterns and the ecology of the hunted species, and tailored to local cultural, socio-economic and political conditions.

Specific recommendations for the national level in bushmeat-range States

1. National policy linkages: The bushmeat economy is largely invisible in most countries. Acknowledging the contribution of bushmeat and other animal products to the local economy will be a first essential step towards sustainable management of this resource. Inclusion of information on bushmeat and animal products in official national statistics may be a next step in order to better understand its role in the country's economy, and as a contributor to local livelihoods and food security.

Forest exploitation has a major impact on bushmeat hunting in several ways: it provides increased access to hunters, attracts more temporary or permanent settlements and, last but not least, it affects wildlife habitat. Therefore wildlife management should be an integral part of National Forest Programmes and (mandatory) forest management plans, as well as National Biodiversity Strategies and Action Plans.

Another key policy linkage should be established with development planning. Policies aimed at poverty reduction can be as important as developing a legislative framework for hunting. Such policies should include the establishment of clear land tenure and land-use rights, promoting the production of alternative sources of proteins, and the involvement of indigenous and local communities in land use planning and natural resource management.

2. Enhancing ownership and links to tenurial and rights reform: In significant measure the bushmeat problem is often a problem of rights. Rural dwellers lack rights to the use of wildlife and other resources they need to secure their livelihoods, hence they are unwilling to invest in wildlife management. Measures to reform the tenurial systems pertaining to all of these resources are urgently needed, including the transfer of ownership or stewardship of wildlife and other natural resources to local communities, so as to stimulate an interest in sustainable use.

⁷ The latter two factors have both direct and indirect effects on wildlife resources: logging often degrades wildlife habitat, and in addition increases harvesting levels, as logging crews rely on bushmeat for nutrition and additional income. Also, logging roads facilitate the quick access to bushmeat markets. Changes in the agricultural sector, in particular intensification and increasing of production units, can change the habitat for species which thrive in swidden agriculture and agro-forestry.

⁸ Readers are encouraged to refer to the publication "Conservation and Use of Wildlife Based Resources: The Bushmeat Crisis" (Nasi et al., 2008), which is available from the CBD Secretariat (www.cbd.int), for the full set of recommendations.

Opportunities exist, for example within the Poverty Reduction Strategy Papers and Forest Law Enforcement and Governance (FLEG) processes, to advance the rights and tenurial changes needed to ensure sound management of rural resources, bushmeat included.

3. Legitimizing the bushmeat debate: Policy is unlikely to be advanced as long as bushmeat is not present in the public discourse. The aura of illegality that surrounds all aspects of the trade is unhelpful to the policy process and is preventing a sound assessment of management requirements. Moves to legalize a portion of the trade would increase the reliability of information on the bushmeat commodity chain, and information about possibilities for adding value to the commodity chain in a way that is sound in terms both of biodiversity (conservation effects) and development (poverty reduction).
4. Legislative review: National legislation on wildlife and hunting often suffers from incoherence and impracticality. Well-established and widely accepted practices may be *de jure* (according to law) illegal, thus increasing the opportunities for corruption, and the steps required to achieve legality may be so impractical as to encourage illegality on the part of otherwise law-abiding citizens. Range States are therefore encouraged to review their existing legislation for policy coherence and cross-linkages (see above); practicality and feasibility; the potential for incentive measures; and law enforcement capacities; and rationalization of the law to reflect actual practice, without surrendering key conservation concerns.
5. Protected areas: Protected areas are an essential component of any strategy for sustainable use of wildlife at the landscape level, and large protected areas will be essential for conserving the larger animals. In addition, landscape level planning for habitat connectivity and resilience is rapidly gaining importance in view of the need to adapt to climate change. At the same time, a balanced approach to protection policy is required, giving greater attention to the designation and management of protected areas, with due regard to all aspects of sustainability, including poverty reduction needs. The fact that biodiversity hotspots are often associated with human settlement and impact renders this a challenging issue.
6. The role of science in wildlife policy: heavy investments have been made in many bushmeat range states in relation to in the scientific study of wildlife populations and the impacts of their use. However, the value of this research has been limited by its frequent close association with advocacy groups, often representing the interests of external constituencies. Support is needed to increase the information base of national policy-makers (government and non-government) and to reduce their dependence on advocacy-based organizations with external constituencies and mandates.
7. Engaging the private sector: Approaches to conservation in production forests have tended to focus on restricting the impact of timber concessionaires and their personnel. While these efforts are in many ways to be commended, the implications for the livelihoods and welfare of local populations have not been adequately considered. Policy development needs to go beyond the interests of the reputable loggers and the external organizations, and to embrace public participation of local stakeholders, in particular indigenous and local communities.
8. Learning processes: Greater attempts are needed to investigate and build on the experience in the context of sustainable forest management, and of other sectors for ideas and models that might help to improve the management of the bushmeat trade. Examples of relevance might include sea fisheries (e.g. lessons learnt from the collapse of the North Atlantic cod fisheries, etc.), the pharmaceutical industry, and herbal medicines.
9. Substitution and other palliative measures: A shift in thinking is needed, away from palliative measures intended to mitigate the effects of wildlife harvest with minimum implications for the

status quo (e.g., captive breeding of game species; livestock breeding schemes intended to replace existing sources of animal protein; integrated conservation and development projects – ICDPs), towards more radical measures to improve integrated management and governance of wildlife resources. At present, the low purchasing power of local populations severely restricts the development of alternatives for the use of wildlife.

Specific recommendations for the international level

1. **The need for national ownership:** The international community is called on to give much greater support to range States to bring the bushmeat problem under effective national ownership in ways that provide broad local and national benefits. One area where this process is underway is with the CITES Great Ape Enforcement Task Force Country Profiles, which may help develop the sense of ownership by assisting countries in determining or identifying some of the key issues associated with the bushmeat trade.
2. **Democratic process:** Host governments need to be supported to open up the national debate on wildlife management as part of the democratic process.
3. **Policy processes:** International partners should seek to ensure that wildlife issues are, wherever relevant, adequately covered within internationally supported policy processes, such as poverty reduction strategies.
4. **Trade relations:** More consideration needs to be given to the issue of unfavourable terms of trade between wealthy and developing nations. A case in point may be international fisheries policy and fisheries licensing agreements, where there is some evidence of a possible linkage between increase of industrial scale fisheries, and increase of bushmeat consumption levels as a protein substitute for fish stocks that are lost due to industrial-scale overfishing. To the extent that this evidence is confirmed, the manipulation of international trade patterns (e.g. EU marine fisheries subsidies) could indirectly influence the bushmeat trade in positive directions.
5. **International trade in wildlife:** An area of particular international interest is the potential for the high-value export of wild meat to act as a force for the rationalization of the trade, and as a means of adding greater value to the lower levels of the bushmeat commodity chain. As matters stand, legitimate channels for export of wild meat simply do not exist in most of the major range States, and this may serve as an incentive to illegality.
6. **International policy environment:** In general terms, international policy might be well advised to give less emphasis to restrictive and repressive measures in the bushmeat-range States, and to give greater attention to the positive incentives that may be required to better manage the wildlife resource as an integral part of poverty reduction and national economies.

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Traditional Fisheries of Rainforest Rivers in the Campo-Ma'an Area of Southern Cameroon

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This article presents a different type of bushmeat – aquatic bushmeat. The authors describe traditional fisheries in rivers of rainforest ecosystems. The case of the Campo-Ma'an Area of Southern Cameroon is analysed to illustrate that the aquatic animal resources of rainforests are important targets of community activity.

Forest waterways are important fishery resources that have underutilised potential to contribute to the livelihoods of forest dwellers and those beyond. Typical of these systems are fisheries in Lower Guinea rainforest rivers (and the forested part of the Congo Basin) that are comprised of two main exploitation systems corresponding to commercial and traditional fisheries. The commercial gill-net fishery target primarily catfish during low-water fishing seasons and are generally operated by men, including full-time and seasonal fishers. Fish caught in this activity is often smoked and stored prior to marketing, providing seasonal food and income for the fisher family. On average, men fish about 144 days per year, capturing an average of 330 kg of fish, for a catch per unit of effort (CPUE) of 1.8 kg/fisher/fishing day. Fishery productivity in the Nyong River, just to the north of the Campo-Ma'an area, has been estimated at 1.3 tons/km² or 13 kg/ha of watershed (Brummett et al. in press). This is similar to the 16 kg/ha of watershed reported for the upper Cross River (Mdaihli et al. 2003).

The traditional fishery in the Lower Guinea, is dominated by women who focus their efforts on the thousands of kilometers of smaller first and second order streams that permeate the rainforest. Basket traps and small dams (alok) are used to capture a wide range of small fish and crustaceans that are consumed directly by the family, contributing to household food security. The harvest, however, is small. In 16 aloks observed over the course of a year, the average weight of fish harvested per alok was 5.14 kg per 280 meters of stream, distributed among an average of 23 people, for a return of 220g per person. With an average investment of 5 working hours per alok (including dam construction), each fisher receives 40g fish per hour of work (Figure 1).

Figure 1. Apportioning a typical alok harvest among the fishers (photo RE Brummett).



Due to low quality carbon and phosphorus inputs from the forest, low alkalinity and low levels of sunlight, the productivity of rainforest streams is generally low (Farjalla 2002, Davies et al. 2008). In the small streams sampled in the Campo-Ma'an area, the fish and crustacean standing stock is 26 g/linear meter. Extrapolated to the 6,610 km of the 1096 low-order watercourses in the Campo-Ma'an National Park and buffer zone, the harvestable fish standing stock can be estimated at 172 tons.

According to local people interviewed, these streams are

harvested on an average every three months, throughout the year. In an attempt to determine the effect of this level of fishing pressure, a study was undertaken on the Bikobikone River. Assuming that the villagers are correct and that these streams can be harvested every three months without significantly reducing the total fish biomass over time, the total annual harvestable production is a bit less than 700 tons. This has a local retail value of about \$700,000. Calculated per hectare of watershed, the total of 0.9 kg/ha is only 6% of the 13-16 kg/ha estimated from annual catch rates in the main rivers of the Nyong

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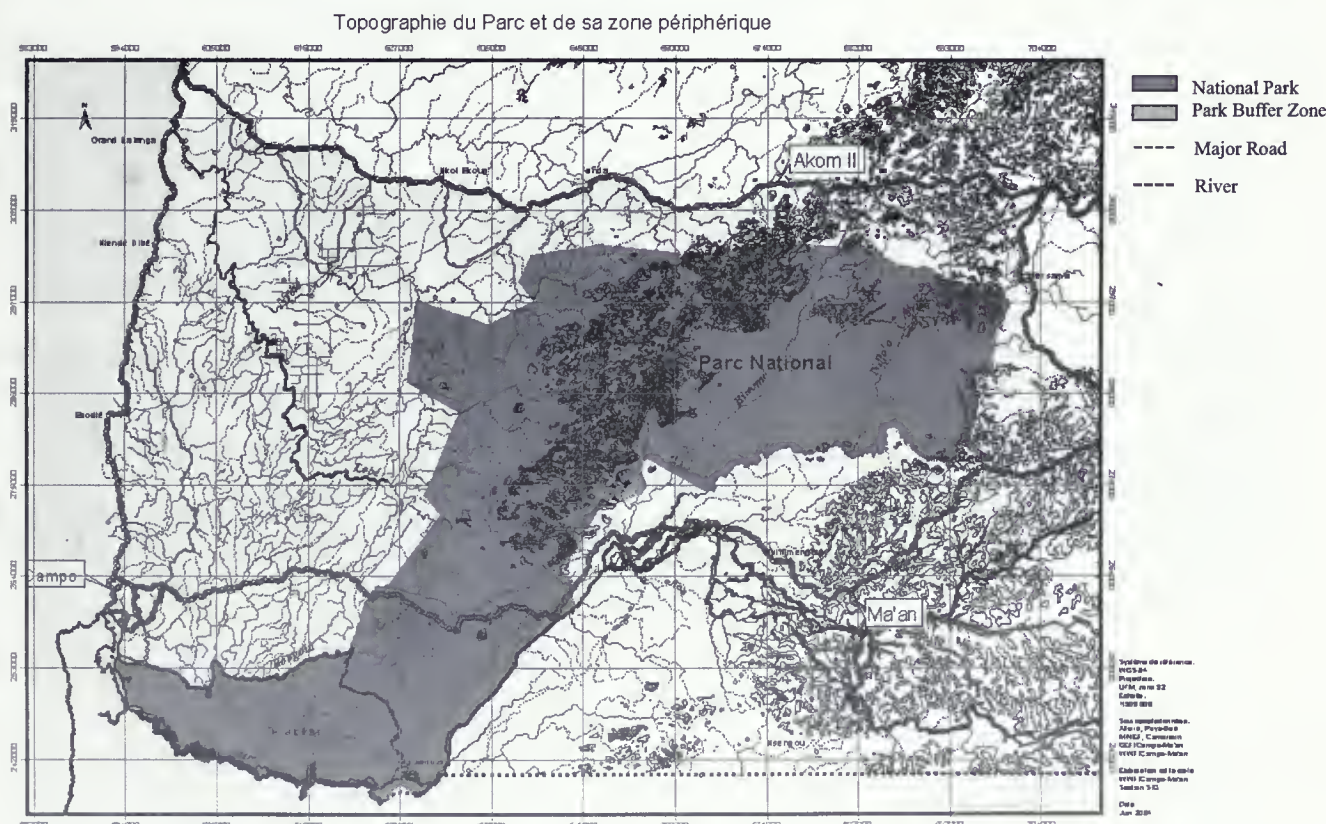
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(Brummett et al. in press) and the upper Cross River watersheds (Mdaihi et al. 2003). To the extent that these estimates are reliable, the vast majority of the biomass in these systems seems to be accumulated downstream in larger order rivers.

The Campo-Ma'an Area of Southern Cameroon: The Lower Guinea Rainforest extends over 500 000 km² along the Gulf of Guinea from the Cross River nearly to the Congo; including some 50 major and minor rivers (Mahé & Olivry 1999). The Campo-Ma'an area of South-Central Cameroon (Figure 2) is typical of the Lower Guinea rainforest ecosystem. The Campo-Ma'an National Park and its buffer zone occupy an area of 7,762 km². Within the buffer zone are two active logging concessions and two agro-industrial estates (hévéa and oil palm). Most of the zone is secondary rainforest having once been logged. New economic developments include two new deepwater ports and an iron mine planned in the area west of the Lobé (WWF, Personal Communication, May 2008). In the park and buffer zone are found at least 1,500 plant species, 390 species of macro-invertebrates (excluding the Arthropoda which have not been enumerated), 249 fish species (in three river basins), 302 species of bird, 122 species of reptile and 80 large and medium-sized mammals, including endangered forest elephant (*Loxodonta africana cyclotis*), forest buffalo (*Synerus caffer nanus*), lowland gorilla (*Gorilla gorilla*), chimpanzee (*Pan troglodytes*), mandrill (*Mandrillus sphinx*), leopard (*Panthera pardus*) and giant Pangolin (*Manis gigantea*) (MINFOF 2002). Endemism in the area is high. Also in the area are some 60,000 people living in 120 villages and 22 pygmy camps. The average population density in the area is 7.3 persons/km², but over a third of the people (24,000) live and work in the two agro-industrial estates, leaving large parts of the area completely uninhabited.

Figure 2. South-Central Cameroon including the Campo-Ma'an National Park and its buffer zone. Main areas of project activity are circled (MINFOF 2005).



As with fish biomass, fish species diversity and richness tend to increase as one moves downstream from a swamp, to first-order forest streams and to medium-sized tributaries to the main channel. This is due primarily to the addition of species rather than through replacement (Géry 1965, Welcomme & de Merona 1988, Kamdem-Toham & Teugels 1998). Reflecting this trend, catch rates at Nkoelon (downstream) averaged 42 g/linear m (29 species) of stream, as compared to 19 g upstream.

The basket-trap fishery is dominated by the freshwater decapod crustaceans *Macrobrachium* spp. and *Atya* spp., locally referred to as "crevettes". Although less important in headwater areas, "crevettes" are of major economic interest in the lower reaches, near the towns of Campo and Kribi. At between \$2.00 and \$6.00 per kg, they are 2-6

times as valuable as other fish. Interviews indicate that there are some 3400 women who actively fish and market freshwater prawns ("crevettes") in the Campo-Ma'an buffer zone. At present, the estimated total revenue accruing to people in the area is about \$3.4 million per year for a volume of approximately 1,140 tons. The vast majority of the crustaceans caught and traded is *Macrobrachium vollehovenii*, the largest crustacean species in the area. It is clear that the aquatic animal resources of rainforests are already important for forest communities, although their significance could possibly be even greater. There is a need to better understand the biological and socioeconomic dynamics of these resources to develop strategies for optimal sustainable management to the benefit of all.

Acknowledgements

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http://www.sage.wisc.edu/riverdata/scripts/station_table.php?qual=32&filenum=1691 Center for Sustainability and the Global Environment, University of Wisconsin-Madison, USA.
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⁵ out of a total female population of approximately 28,000 (MINFOF 2005).

Using GIS to assess the status and conservation considerations of large mammals in the Itombwe Massif Conservation Landscape, Democratic Republic of Congo

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Summary

There is great concern in Africa and the world in general about the loss of biodiversity that calls for more conservation efforts. At current time of hope for peace in the Democratic Republic of Congo (DRC), in the immediate aftermath of devastating civil strife, the scale of wildlife loss and degradation is a major looming threat to the Itombwe massif's biodiversity. This paper highlights potential threats from human activity and outlines a conceptual methodology to support conservation of critically endangered grauer's gorilla in the Itombwe massif by using Geographic Information Systems (GIS) applications. Evaluation of threats from human activity with respect to the conservation of the Massif and its populations of gorilla, *Gorilla beringei graueri* (the type specimen of this subspecies came from the region) as well as eastern chimpanzees (*Pan troglodytes schweinfurthi*), is among the most important conservation priorities as far as the DRC is concerned.

1. Background and Introduction

The Itombwe Massif, located in eastern DRC, to the west of the northern tip of Lake Tanganyika (Fig. 2), holds the largest and most remote block of intact montane forest (1500-1500 m elevation) in Africa. The entire Itombwe Massif and Plateau, covers about 12,000 km² of which an unbroken block which covers 6,500 km² is the single largest block of montane habitat in the entire Albertine Rift (AR), which range from 1500 to 3500 m in elevation (Fig. 1). This area, which we have termed the Itombwe Massif Conservation Landscape (IMCL), contains the most important ape populations and represents the most significant prospects for conservation of the region's endemic Albertine Rift biodiversity (Mubalama, 2005; Hart & Mubalama, 2005). The region lies between 2° 51. 286' and 4° 0.690' Lat S, 28° 09.889' and 28° 58.511' Long E (Fig. 1) and is one of the most diverse sites of the Albertine Rift (Hart & Mubalama, 2005).

Despite its significance, the levels and type of biodiversity of the Itombwe, and the knowledge of the distribution of its great apes, remain incomplete. Field work referred to in this paper has contributed to the creation of the Itombwe Natural Reserve. The purpose of this article is to propose the best locations for concentrating conservation efforts of endangered large mammals, including consideration for habitat quality and relative abundance of populations, as related to the proposed designated protected area. The article also identifies the main threats to the fauna and their habitat using GIS applications.

2. Field work and Methods

2.1. Survey techniques

Fieldwork was carried out from October to November 2003. Further surveys were carried out from January to February 2004, encompassing the central sector of the Itombwe Massif. For the purpose of the study, the area was divided into three sectors: part of West Mwana, East Mwana-South Elila, and North Kiandjo-South Kiandjo (Fig. 4 and Table 3). The precarious security situation in the area did not allow



Fig. 1 Map showing the location of the Itombwe Massif Conservation Landscape in DR Congo

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carrying out survey in the far North Kiandjo-Kakuzi sector as originally planned (Annex 2). As the current surveys aimed at carrying out a reconnaissance, it was decided that all signs, direct sightings of target species and indirect evidence of them, such as tracks and signs (including dung/pellets, night nests, evidence of feeding, trails, debarking), would be used to estimate relative abundance of large mammals in the survey areas. The method used was the reconnaissance walks termed Recce (field observations collected following the path of less resistance), and every effort was made to follow pre-existing human or animal paths by minimising disturbance to the forest (White & Edwards, 2000). Habitat quality was assessed using a protocol developed for this purpose and botanical data was collected in Kyembwa, Apanga, Kyanju, Kasolokochi, and Lubembula (Makenda area) on forest types, including canopy cover, under storey, regeneration, and ground cover, surveying along five transects (Annex 1).

For each sighting, the time, GPS position, altitude, wildlife species or type of human sign identified, method of identification, number of wildlife individuals identified and, some times, habitat type where the species or sign of wildlife presence was detected were noted. Sound, dung, tracks or nests were the most common indicators of species' presence (Plumptre et al. 2002; Plumptre et al. 2003). Skins, trophies and other evidence were also examined, whenever possible.

A simple data sheet was designed to enable standardized data collection on wildlife and habitat variables. Data collected from the field was used to ground truth available satellite imagery and, accordingly, helped to determine different habitat types following the remote sensing applications. Levels of human pressure on the habitat and on wildlife were assessed by recording distance to the nearest village, evidence of agricultural activities in the vicinity, signs of hunting (fresh and old), current paths through the study area, and signs of recent mining. 4-8 hours per day were spent investigating the reconnaissance paths and recording data, at a pace of 4.22 km per day. Throughout the study, field teams of experienced staff and several guides from the local communities were used.

3. Results and Discussion

3.1 Species richness

Signs of at least 44 species and sub species, out of 94 species described by Omari et al (1999), were found during the surveys. Most of the duiker species (large and small) and monkeys were identified and classified. More than three hundred and eleven types of evidence were found, with a presence index varying between 13 and 38 (Mbayma, 2004), except for the cane rat (*Tryonomys* sp) and the blue duiker

(*Cephalophus monticola*) which had a total record index of around 9 while it was around 5 for the water chevrotain (*Hyemoschus aquaticus*). For gorilla (*Gorilla beringei graueri*), chimpanzee (*Pan troglodytes schweinfurthi*) and other primate species, the number of evidence varied between 1 and 2. Blue monkey (*Cercopithecus mitis*), Red-tailed monkey (*Cercopithecus ascanius*) and yellow-backed duiker (*Cephalophus sylvicultor*) were present but at extremely low densities. Based on the data from the surveys, it was clear that poaching is a common activity given the low densities of prey. L'Hoest's monkey (*Cercopithecus lhoesti*) was reported by hunters to be present in surveyed areas. Based on its habitat requirements and distribution, this species was expected to occur in Itombwe, however, the existence of the owl-faced monkey *Cercopithecus hamlyni* remains questionable. Although little information was gathered from hunters on this specific species, existing literature suggests that it may be present in the area.

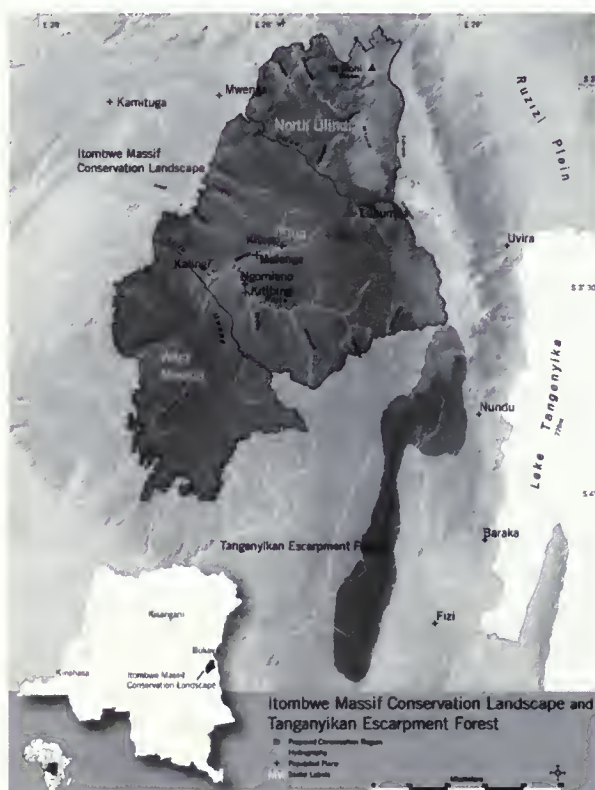


Figure 2. Itombwe Massif Conservation Landscape and Tanganyika Escarpment Forest

Signs of gorillas were seen in some of the key reproductive sites referred to as maternities which appeared to be geographically discrete areas. Gorilla nests and other signs of presence were found at elevations of less than 1,100 m in the transitional forest zone, to over 2,094.8 m near the Lungye gorilla maternity. Although most of the signs of gorilla were in secondary vegetation, signs of this species were also present in agricultural fields, at the savanna border of human settlement. We also found signs of presence of gorillas in the bamboo zone, but at low densities, suggesting that this habitat, which in Itombwe covers more area than in any other area in Africa, may have been used by the gorillas only on a seasonal basis. In contrast to gorilla, chimpanzees were widely distributed, occurring in primary forest as well as in secondary vegetation. Although, we cannot yet provide estimates of chimpanzee numbers for the Itombwe massif, they were clearly more abundant than gorillas and appeared to occur in larger groups than gorillas.

Encounter rates for gorilla nests in 2003 (0.19 per km) was higher than the rates of encounters of other wildlife species during the same period. The gorilla nest encounter rate was followed by signs of bush pigs (0.11 per km), then by chimpanzee nests (0.08 per km) and, last, by rodent encounters (0.07 per km). Rodents remain so far the preferred species for hunting. In some parts of the Itombwe Massif, hunters were setting traps to catch muroid rodents, and pouched *Cricetomys emini*, squirrels and brush-tailed porcupines *Atherurus africanus*. Few larger game catches were documented during the survey, implying that the ungulates have been hunted out (Mubalama, pers. comm.). Rates of encounters with all key large mammal species observed are presented in Fig. 3 below.

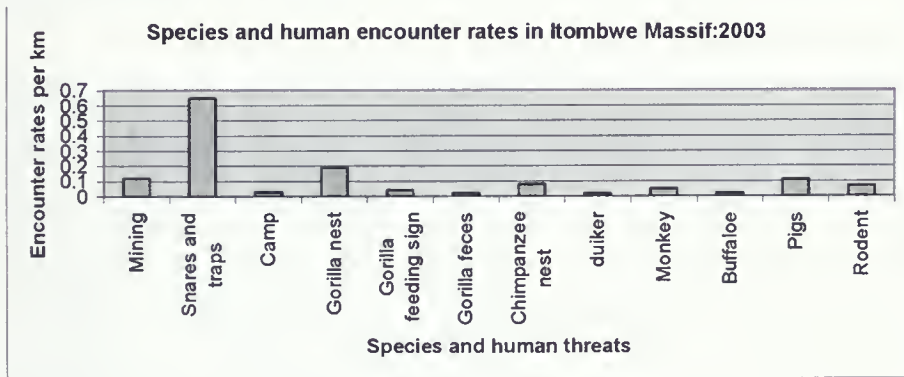


Fig 3. Species and human encounter rates in Itombwe Massif, 2003

3.2 Relationship between signs of human and mammal presence

Spearman rank correlations generated with Statview 5.0 programme were used to investigate the relationship between signs of human disturbance and signs of large mammals. There was no significant correlation between mining and tree cutting and signs of gorilla; or between mining, agricultural activity and chimpanzee nests; or between chimpanzees other signs and gun shooting (Table 1). Snares were the most frequently used hunting tools and there was a significant correlation between snares and bushmeat signs. Data to assess hunting intensity were collected over a total distance of 502.17 km (straight line) of reconnaissance paths. One hundred and ninety six km², out of 832 km², were found to have records or signs of hunting; this amounts to 0.25 per km². This rate is very high considering that only actual sighting and fresh tracks on reconnaissance paths were considered. Hunting methods employed by local people fall into two categories: hunters using dogs to capture live animals; and the shooting or snaring of large mammals, depending on the size and species involved. Mining was yet another serious problem (Bisidi et al. 2008). There was ample evidence that gold mining along the rivers was common in the recent past as there was much damage to the riverbeds, riverbanks and the bordering forest. At present, many former mines and their associated settlements and roads are covered by secondary forest and dense herbaceous undergrowth. A number of former mining camps served as a base for hunters.

Shifting cultivation was recorded in all surveyed areas, including secondary forests and small patches of *Pennisetum mauricianum* savanna. There was a significant correlation between tree cutting and

Table 1 Spearman rank correlation coefficient (rs) for the relationships between human activity and large mammals at 33 sites. Correlation coefficients in **bold** have $p < 0.05$

	Snares or traps	Mining	Tree cutting	Cultivation	Gun shot	Bushmeat
Gorilla nest	-0.018	0.141	0.249	0.041	0.281	0.452
Gorilla ¹	0.419	0.281	0.230	0.395	0.482	0.457
Chimp nest	0.381	0.335	0.440	0.242	0.298	0.662
Chimp ¹	0.416	0.450	0.619	0.310	0.137	0.509
Elephant	0.282	0.479	0.586	0.303	0.445	0.829
Buffalo	0.590	0.391	0.504	0.177	0.309	0.531
Duiker	0.540	0.523	0.390	0.301	0.113	0.433
Sitatunga	0.577	0.818	0.483	0.523	0.518	0.706
Primate	0.494	0.479	0.586	0.303	0.443	0.829
Squirrel	0.168	0.602	0.453	0.352	0.444	0.492
Porcupine	0.293	0.457	0.448	0.232	0.202	0.492
Cane rat	0.127	0.341	0.293	0.086	0.406	0.511
Bush pig	0.458	0.455	0.537	0.431	0.520	0.559

¹ Other than nest sign, including feeding, faeces, tracks etc.

Table 2 . Spearman correlation s (rs) among human signs in Itombwe Massif

Human Activity	Mining	Tree cutting	Cultivation	Gun shot	Bushmeat
Snare or traps	0.479	0.399	0.571	0.232	0.436
Mining		0.605	0.467	0.415	0.614
Tree cutting			0.378	0.359	0.729
Cultivation				0.295	0.451
Gun shot					0.577

There was a clearly observed difference in the number of wildlife tracks recorded in the forest areas around military positions. This is not surprising as various forms of human activity were recorded near military camps, including in Kalingi and Lubumba, which were highly disturbed because of soldiers' presence and uncontrolled hunting around the villages. Signs of gorillas and antelopes were more common in the Asolokochi, Asebu, Kongwa, Lutenga and Makyemwilu areas (Annex 1), where the habitat appeared to be more suitable for them (Fig. 4). The paucity of indirect evidence of presence of gorilla species in the Mwana and Bikongyi areas might be related to the habitat they occupy-riverine and dense forest patches- where dense leaf litter hinders sightings of tracks and pellets. The antelope's small tracks were much harder to detect. Thus, the status of antelopes in the forest could not be easily determined, especially during the rainy season, but judging from information received in villages, they were likely to be under severe hunting pressure (Mbayma, 2004). There was a clear negative relationship between occurrence of threatened species and human use of the same area.

As shown in Table 3 below, three sectors were surveyed (North Ulindi, Upper Elila, and Mwana-kiliza) and the number of grids surveyed was recorded alongside total distance covered in the *survey zone*. In North Ulindi sector where a total distance of 64 km was covered, the presence of ape species was noticed in 14 km covered by the field teams. In Upper Elila sector, a total of 806 km was covered within which ape presence was observed in 124.3 km; hunting was discerned in 262.88 ha, mining in 366.76 ha and pastoral agriculture in 943.4 ha.

Table 3.Itombwe Massif Sector Threats Results

2 km x 2 km grid coverage						
Sector	survey zone		Ape presence	Area in which hunting was observed	Area in which mining was observed	Area in which pastoral agriculture was observed
	No of Grid surveye d	Total distanc e covere d (Km)	Distance covered before detecting ape presence (Km)	Ha	Ha	Ha
North Ulindi	14	64	14			
Upper Elila	201	806	124.3	262.88	366.76	943.4
Mwan a - Kiliza	15	48	20.57			
Total	230	918	158.87	262.88	366.76	943.4

3.3 Enforcement of regulations at local level

Implementing quotas or enforcing existing regulations and promoting alternative snaring schemes, will require fundamental changes in the attitudes of local people, and an increase in the ability and willingness of traditional local authorities to enforce regulations. Local people should be encouraged to implement quota systems through economic incentives, such as increasing local alternative income to discourage excessive or illegal hunting, through education and by raising public awareness of issues; and through existing cultural background by encouraging social traditions that preclude selfish, individual hunting. It may be possible to integrate the traditional taboos of certain sections of society against eating certain species. These taboos may be related to perceived health risks, the health of future children (Gadsby et al. 1992., Heymans, 1994., Muchaal & Ngandjui, 1995., Noss, 1998); religion, or physical and behavioural similarity of apes to humans (Bennett et al. 1995). However, people in many of the areas in which these traditional beliefs were once strongly held are now becoming less strict in adhering to them as a result of increased poverty followed by high level commercialization of bushmeat.

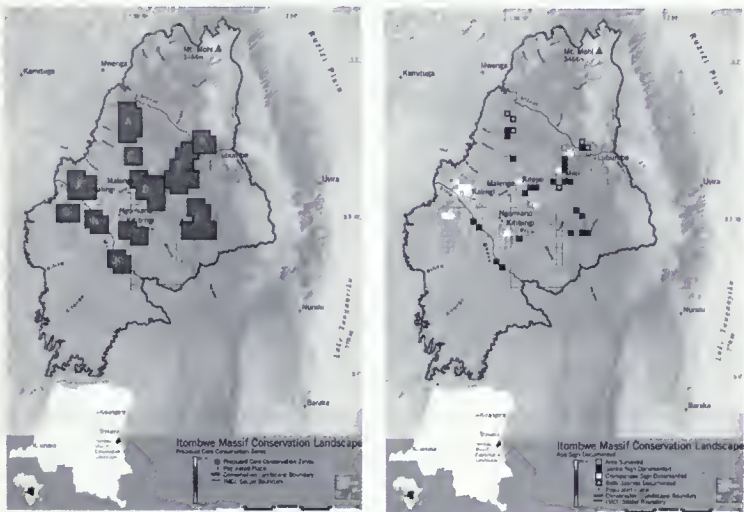


Figure 4. Priority area of the IMCL

The establishment of a specific, restricted season for hunting, or the demarcation of reserves to stock hunting areas would have local support in many areas, but would also require government enforcement of rules. Full protection will have to be concentrated on priority areas (Fig. 4) identified by the National Wildlife authority in collaboration with local people. Again, effective local and national enforcement of existing game legislation is a prerequisite, all the more so since established protected areas are under severe threat (Bruner et al. 2001).

3.4 Does alternative protein sources matter?

The twin imperative of addressing people's needs and aspirations on the one hand, and conserving the Itombwe wildlife species on the other, has suggested to many a 'silver bullet': solve the bushmeat crisis by alleviating poverty. At the local level, one option is to encourage intensive breeding of cane rats (*Tryonomys* sp) and Giant pouched rats (*Cricetomys emini*), which are already being consumed in large quantities. In addition, many people living in or close to tropical forests today still use wild meat as a major source of protein (Bennett & Robinson, 2000). In Central Africa about 645 kg of wild meat is extracted from each square kilometre of forest every year (Wilkie & Carpenter, 1999). Therefore, it is only in conjunction with awareness and education programme that changes in local, consumer attitudes and buying habits might be achieved. The transition to the use of domesticated sources of animal protein must be made before wildlife populations become irreparably depleted (Bennett & Robinson, 2000).

4. Conclusions and Recommendations

Protection of representative areas of natural habitats of wildlife species, in which priority is given to conservation, is an essential 'backbone' in an integrated conservation strategy. Such areas act as reservoirs for plant and animal populations and help maintain the ecological processes within the ecosystem. Key areas of habitat should be as large as possible, preferably the largest, most intact blocks of habitat remaining within the presently investigated planning zone. Systematic conservation planning remains widely considered the most effective approach for designing protected area and other ecological networks. However, many conservation practitioners still ignore these methods and we suggest that GIS and remote sensing applications be widely used for this purpose in the near future. Whether or not people are merely using the resource or truly depend on it, we must act now to accelerate the transition to domestic sources of animal protein before all the wildlife is gone.

5. Acknowledgements

We are grateful for the research grants provided through Wildlife Conservation Society and the World Bank. We are indebted to ICCN (Congolese Wildlife authority) headquarters for administrative support. Local traditional, military chiefs and local field assistants have been of keen assistance during the height of civil strife in the study area.

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Annex 1. Status of Itombwe and Tanganyikan Rift Gorilla populations 1996 – 2004.

1996 gorilla zone	2003 – 2004	2004 Proposed Core Conservation Zones	Gorilla presence	Note
	Surveyed			
Mutambala – Sanje	Yes	Confirmed	None	Tanganyika Escarpment Forest Zone
Ibachilo – Ngomiano West Mwana	Yes	Confirmed	H,K	
Kabelukwa – Kitibingi- Mt Kasondjo	Yes	Confirmed	H,I	Apparent reduction in population 1996 to 2004
Mts Lungye, Ibenga	Yes	Confirmed	J	Gorilla area larger than estimated in 1996
Kapanga – Kiandjo - Miki	Yes	Confirmed	D, E	Gorilla area larger than estimated in 1996
Mt Kipapa	No	Not Confirmed	F	Chimpanzee confirmed
Lueno - Milanga	No			Survey required
Mts Ngusa, Nolabi	Yes	Confirmed	E, B	1996 gorillas confirmed south bank Ulindi
Kakanga	No			Surveyrequired
Nzombe	Yes	Confirmed	A	Apparent reduction in population 1996 to 2004
North Ulindi	Yes	Confirmed	B	Not confirmed 1996.
Kikuzi - Nemereze	Yes	Confirmed	C	Previously unknown population.

Annex 2 Itombwe Massif gorilla and Chimpanzee Conservation Areas, 2003 -2004

Conservation Area		Apes	Threats	Groupements	Community Engagement
		Gorilla,chimpanzee			Local traditional chiefs, traditional agreement, proposed limits, village monitors.
Nzombe-Kakanga	A	gorilla	No Data		
Muhuzi Buzinda	B	Gorilla, chimpanzee	H		Refer to local traditional chief agreement in USFW proposal
Kikuzi	C	gorilla			
Miki Complex	D	gorilla chimpanzee	H	Basimukindji l	
Kiandjo-Kitopo	L	Gorillachimpanzee	H	Basimukindji l	
Kipapa	F	chimpanzee	H		
Nyongya	G	chimpanzee	H	Basikamakulu	
Ilambo	H	gorilla	H	Basimunyaka	
Namasalakoma	I	Gorilla,chimpanzee	H	Basimwenda	
Ibenga Lungye	J	gorilla	H	Basimukindji l	
Mwana Valley	K	gorilla	H	Basimuyaka	

H = Hunting

A = Agriculture all except J, C, G,

L = Livestock, only C, I, H have it

M = mining D, J, I, K, have it

Next Steps (community conservation zones, Consultation, Agreements, Management plans; Staffing and Execution)

Ongoing study on the integration of biodiversity concerns in management of forest concessions in Central Africa

Oudara Souvannavong¹, Alain Billand², Jean-Claude Nguingiri³ and Jérôme Fournier⁴

Summary

Central Africa is home to the world's second largest contiguous tropical rainforest, after Amazon. Depending on countries in the sub-region, between 10% to 15% (Nasi, Cassagne, Billand, 2006) of the forests' surface area is occupied by protected areas. Production forests represent 65% of the forests and have an enormous potential for biodiversity conservation. The important role played by production forests in maintaining biodiversity should be improved through increasing the percentage of forests that have management plans that take into account the different functions of the forest.

FAO and CIRAD (the Agricultural Research Centre for International Development) have assessed the status of integration of biodiversity and are striving to identify the difficulties encountered in this area.

This study is based on bibliographic research, documents such as management plans, forest regulations, national guidelines and a survey of professionals (administration, logging companies, consulting firms, NGOs and forest certification agencies) carried out from May to June 2008 in five countries of Central Africa.

Following analysis of the collected information and their validation, concerted actions and a set of programmes will be proposed to reinforce and harmonize practices for better integration of biodiversity conservation concerns in production forests of Central Africa subregion.

Introduction

Tropical forests are the most important custodians of terrestrial biodiversity essential for the maintenance of species' ability to adapt to environmental changes and changes in users' needs, and to support the functions of ecosystems. Moreover, tropical forests are the most threatened. In Central Africa subregion, depending on countries, between 10% to 15% of forests are categorized as protected area while production forests represent 65% of the forest ecosystem (Nasi, Cassagne, Billand, 2006). Thus, forests that are not formally protected have an enormous potential for biodiversity conservation.

Logging companies are now required by Law to contribute to biodiversity conservation (management plans are now obligatory) and they also have the option to embark on eco-certification. Within this context, FAO and CIRAD have launched a study on the integration of biodiversity conservation in forest concession management in Central Africa. In the framework of their collaboration with the Central Africa Forest Commission (COMIFAC) to implement COMIFAC's Convergence Plan, FAO and CIRAD have initiated a subregional study with major stakeholders in the sector (forest administrations, logging operators in the private sector and their partners) in order to assess the status of current practices (even without management plans) in central Africa. This study also seeks to identify the problems and constraints in addressing biodiversity issues in forest concessions and shorter term timber harvesting permits/licenses in central Africa.

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Tropical forest is so complex that it is not feasible to comprehend it all without long-term concerted efforts. Biodiversity abounds considerably in its broadest sense at the level of ecosystems, species and intraspecies. Thus, it is impossible to monitor and manage it comprehensively: there is a need to make choices (IUCN, 2007). For example, the behavior of fauna in rain forests (reproduction, feeding habits, etc.) as well as its interactions with other species and with their habitat and the vegetation remain largely unknown. Consequently, in several cases, data collected on fauna by logging companies during their management inventories, are new for the scientific world (Billand, 2005) with inventory methods constantly updated. Our knowledge of the field of study is limited and we are faced with vital issues: what are the aspects and priorities for the protection of logged forests; how to collect reliable data and how to establish a monitoring mechanism to assess the success of management measures that have already been put into operation (IUCN, 2007).

Currently, twenty five to thirty million inhabitants in Central Africa live in direct contact with this ecosystem and more than three million depend on it for survival (Billand, 2005). The human society as a whole is responsible for the environment and has to take drastic decisions. However, depending on the territorial scale and the country, protection priorities could vary according to various cultural values and different levels of economic and social development. Different choices will inevitably be made in terms of biodiversity conservation strategies and priorities. (IUCN, 2007)

The present format of forest management in central Africa subregion began emerging twenty years ago. The first forest management plan was formally implemented in 1998 (Concession IFB/Ngotto, CAR). However, the principles for the formulation of forest management plans originated from activities and studies several decades old (more than 60 years). It is estimated that more than half of forest concessions in Central Africa are in the process of drawing up plans for their management. Others are already being managed, with 30 millions hectares (Mha) out of approximately 55 Mha of concessions. These are part and parcel of the 130 Mha of production forests in the sub-region (Nasi, Cassagne, Billand, 2006).

The preliminary phase of management requires different studies that enable managers to know the presence, number and the distribution of species as well as their importance and threats. These studies consist of:

- Tree inventory
- Multi-resources inventory (fauna, Non-Wood Forest Product – NWFP)
- Socio-economic inventory

It is worth noting that, in these initial studies, the focus was mainly on the collection of data related to stumpage of commercial value. Consequently, the methodological settings of the inventories have been first calibrated to sample the variable 'tree' with the best cost-accuracy ratio possible. The statistical accuracy of forest management inventories is calculated today at 95%, a value commonly accepted by national standards, which translates into a sample ratio of about 1% to 1.5%. Concerns related to biodiversity and social issues were secondary. In most of the cases, biodiversity inventories and NWFP are aligned according to the measuring devices for trees, which is not necessarily optimal.

Laws differ according to countries concerning the types of studies to be conducted. Moreover, not all countries have at their disposal a framework or set of rules detailing the methods to follow. For example in the Democratic Republic of Congo, it has been obligatory since 2007 to follow operational guidelines for forest management in order to validate methods and results. The Central African Republic adopted national forest management standards in 2002.

FAO, CIRAD, CIFOR (Center for International Forestry Research), IUCN (International Union for Conservation of Nature), ITTO (International Tropical Timber Organization), ITTTA (International Technical Tropical Timber Association) and other organizations produce manuals and management guidelines to assist managers and logging operators. One of the most recent examples is the study on the

management plan for natural production forests in tropical Africa. In Part I of this study, 'ITTTA Forest production' was edited in 2001 and revised in 2006. Part II was focused on social aspects and a third on *the integration of faunal aspects in concessions* was later added. These technical documents integrate environmental and biodiversity issues at the level of the study, analysis, decision making and formulation of management standards and procedures.

The challenge of this study is to identify the different methods currently used by enterprises, during the different phases of study and analysis that led to the environmental orientations until their application in the logging concessions. The primary objective of this study is to assess the current situation on biodiversity integration in the logging companies (with or without management plans) in central Africa, by recording problems encountered by logging operators in the field. The second objective is related to the identification of needs for better management of biodiversity.

Method and programme

Information is collected (through documentary studies and surveys, and when necessary through field visits taking advantage of synergies with other FAO and CIRAD-led projects) in order to assess the integration of biodiversity into forest concessions in Central Africa, especially concerning the following points:

- Achievements in collecting biodiversity data : concessions involved, methodologies, typology of existing data, with issues of rights to access data (public/private) for science and for biodiversity managers and decision makers ;
- Biodiversity management practices in concessions: measures taken in management plans, operational measures for low-impact timber harvesting, control measures and internal system for sanctions against staff, etc.;
- State of the art for the periodic monitoring of biodiversity in concessions. The establishment of monitoring is a must in the case of a certification procedure as certification is a pressing issue for companies exporting to other countries. However this procedure is based on systems of criteria and indicators that are imprecise, subject to various interpretations among auditors due to a poor state of the art;
- Emerging interactions between concessions and protected areas; need to search for long-term partnerships;
- Institutional arrangements and capacities for the integration and monitoring of biodiversity in concessions;
- A more global integration of biodiversity, for example in tracks of forests, according to a coherent territorial approach, taking into account groups of concessions in homogenous or complementary blocks.

Various types of documents were consulted, such as international reports, national regulations and guidelines, texts to facilitate application of decrees, inventory reports and available forest management plans.

Following each interview, the completed questionnaire is edited by a member of the team and returned to the interviewee for verification and additional information. The study is based on discussions with practitioners and stakeholders in the sector. During a second phase, the initial results will be presented to participants to cross check sources and gather comments while verifying the initial hypothesis. The set of data processed and analyzed will be synthesized and presented during a sub-regional workshop to be held at the end of 2008. This workshop which will bring together key active stakeholders will provide fresh opportunity to collect additional views and suggestions.

Schedule

Clarification of approach and methodology of the study April 2008

Collection and verification of information

May-August 2008

Synthesis of information and report writing

July-September 2008

Organization of workshop by COMIFAC to present results

September-December 2008

Expected outputs

The report will be presented in two parts:

- A summary of surveys administered to logging operators and other key actors in central Africa subregion. It should outline current practices for the integration of biodiversity in forest concessions as well as requirements to improve these practices and build capacity. This summary will complement data from Forest Watch for Central Africa - OFAC (Observatoire des Forêts d'Afrique Centrale). It is an observatory recently launched, with an initial support from the European Union (EU) through the FORAF project. The project is intended to federate partners of the Congo Basin Forests Partnership (PCBF) under the aegis of COMIFAC.
- Based on the summary, assessment of the surveys, proposals will be put forth to reinforce and harmonize practices for the integration of biodiversity in forest concessions in Central Africa. These proposed actions will take into account initiatives in the sector at global, regional and national levels. A programme detailing some of the proposed actions will be identified and could serve as a basis for a project proposal to be undertaken by FAO in collaboration with other partners. Moreover, it could lead to the description of the main steps for a regional initiative for the harmonization and reinforcement of the integration of biodiversity conservation in forest concessions in the Congo Basin.

Organizations involved in the study

This study is currently being carried out through the analysis of interviews to which more than thirty professionals of the sector (administrators, logging companies, NGOs, forest certification organizations, consulting firms) participated from 20 May to 24 June 2008 in Cameroon, Gabon, Congo, Central African Republic and Democratic Republic of Congo.

Organizations met by FAO and CIRAD:

Observations

The main objective in establishing a forest concession remains the production of timber for industrial purposes. Through forest concessions the State, as the owner of the forest, transfers the right to exploit this economic resource in exchange for remuneration paid as a rent and a variable profit depending on production. The forest management plan is the tool that brings into balance the ecological functions of the forest and the requirements of industrial timber harvesting and commercialization. Today, in view of the international and local demand,

COUNTRY	LOGGING COMPANY	NGO	CONSULTING FIRM	FOREST CERTIFICATION ORGANIZATION
GABON	DLH	WWF	TEREA	PAFC
	LEROY	WCS	SYLVAFRICA	
	OLAM			
	PRECIOUSWOOD			
	RIMBUNAN HJAU			
	ROUGIER			
	SUNLY			
CAMEROON	TBNI			
	ALPICAM		VERITAS	FSC
	DELCOVENAERE			
	SCIEB			
	SEFAC			
	TRC			
	VICWOOD			
Republic of Congo	WIJMA			
	Eucalyptus Fibre Congo	WCS		
	FORALAC / FORAMAK			
	Nouvelle TRABEC			
Central African Republic	TAMAN			
	SCAF			
Democratic Republic of Congo	SEFCA			
	ITB	WWF		
	SICOBOIS			
	SIFORCO			
	SODEFOR			
Total	SOFORMA			
	26	2	3	2

biodiversity issues as well as social issues have become an integral part of the forest management plan. In the context of the forest management plan, forest industries adapt their production tool to better integrate the different functions of the forest (economic, social and environmental).

Logging companies are responsible for their employees during working hours. They are not responsible; neither do they have the authority, to prohibit hunting by local populations. Logging firms are requested by the Law to make an inventory of big games. The study should indicate how information on fauna is used and how they influence the behaviour of logging operators and the people.

Based on a better knowledge of constraints, strengths and weaknesses of current practices related to the management of biodiversity in forest concessions, the study will suggest main actions to assist the forest industries through:

- Participatory formulation of and support to the pilot implementation of the operational mechanisms relative to logging industries. These have the potential of reducing the impacts of industrial timber harvesting activities on biodiversity;
- The concerted definition of protocols which combine scientific accuracy with acceptable economic and operational feasibility for the collection and monitoring of data on biodiversity. These monitoring protocols will be essential to assess the effectiveness of the implementation of the measures in the field.
- Support to Administrations in charge of the elaboration and implementation of biodiversity norms to which enterprises are subject. These administrations will need to enhance their human and operational capacities in order to carry out the monitoring.

This study is in line with the support that forestry administrations and the forest industrial sub-sector as a whole, have received over the last ten years. This is a remarkable progress from the limited focus on economic production of industrial wood to a more integrated approach of sustainable development.

ABBREVIATIONS

ITTTA:	International Technical Tropical Timber Association
CIFOR:	Center for International Forestry Research
CIRAD:	Agricultural Research Centre for International Development
COMIFAC :	Central Africa Forest Commission
FSC :	Forest Stewardship Council
OFAC :	Institute for Central Africa Forests
ITTO :	International Tropical Timber Organization
PAFC :	Gabon Forest Certification Scheme
PFBC :	Partnership for the Congo Basin Forests
PFNL :	Produits Forestiers Non Ligneux
FORAF Project :	EU's Contribution to OFAC (see OFAC)
IUCN :	International Union for Conservation of Nature
EU :	European Union

WCS: Wildlife Conservation Society
WWF: World Wildlife Fund

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Impact of *Allanblackia* nut harvesting on wildlife: Is the ecosystem at risk?

Samuel Kofi Nyame¹

Allanblackia is a plant of the Clusiaceae family, which worldwide contains approximately 40 genera, consisting of nine tree species, all restricted to Africa. All members of the genus are apparently dioecious (separate male and female trees), and the tree species are long-lived. The tree species are also long-fruited (the timeframe from flowering to fruiting spans almost one year; with fruiting commencing around November and attaining maturity in April/May. By the time the fruits begin to drop, the trees are already in flower again). *Allanblackia stuhlmannii* produces the largest fruit of all plants in the African rainforest.

Allanblackia species are mainly distributed in the wet evergreen rainforest of the lowlands of Sierra Leone, along the Gulf of Guinea, through the Democratic Republic of Congo (DRC), to the uplands of the Eastern Arc Mountains of Tanzania. The seeds of three *Allanblackia* species (*A. parviflora* in Upper Guinea; *A. stuhlmannii* and *A. ulugurensis* in Tanzania) contain edible oil which consists almost exclusively of triglycerides of stearic- and oleic fatty acids which are of interest to foodstuff manufacturers. The economic viability of *Allanblackia* oil has been established.

Commercial development of *Allanblackia* oil for export is being promoted by the “Novella Africa” initiative through a partnership composed of Unilever, The World Agroforestry Centre (ICRAF), the United Nations Development Programme (UNDP), International Union for the Conservation of Nature (IUCN), Netherlands Development Organisation (SNV), the State Secretariat for Economic Affairs in Switzerland (SECO), and a number of governmental organizations and NGOs in Africa. Launched in Ghana, the “Novella Africa” initiative is unique in that it is being set up with local communities and small scale businesses, in cooperation with non-profit development partners and local governments. In addition to taking the original initiative for the project, Unilever is providing a market for the finished products.

The “Novella Africa” project is investigating the socio-economic, species and botanical impacts of *Allanblackia* commercialization with the intention of providing instruments that will ensure sustainable harvesting as well as equitable sharing of benefits among the stakeholders.

The *Allanblackia* fruit is heavily predated by wild animals. This attribute is exploited by hunters who set traps around fruiting trees and use the fruit as bait in bushmeat traps. Indeed, the tree has often been retained on farms for this reason as bushmeat is an important component of local diets and incomes.

Harvesting fruit from wild trees for commercialization of the oil involves the collection of between 100-150 fruits (each fruit containing between 25 – 40 seeds) from a single tree. The removal of such large quantities of energy-rich fruit and seeds of *Allanblackia* from the ecosystem may impact on fauna.

On the other hand incentives to retain and establish more trees within farmed landscapes is likely to have positive effects on fauna and faunal diversity, even if only a small proportion of the fruit will be available to wild animals. Restoration of landscapes through protecting *Allanblackia* wildlings and enrichment planting may promote wildlife species dependent on the fruit. However, there is still an immense gap in knowledge and information regarding the impact of collection of large quantities of *Allanblackia* nuts from the wild. Conversely, there is also lack of information on the effect of wild animals on the pollination, seed dispersal and regeneration of *Allanblackia* spp.

Research is needed to investigate the consequences of removal of Allanblackia seeds on wildlife and the forest ecosystem, as well as on the effect of wildlife on the pollination, seed dispersal and regeneration of this tree species.

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What should be done pending the carrying out of a comprehensive research? There are two options :

- *A moratorium might be placed on commercial scale harvesting of the Allanblackia nuts before results of the research is known; or*
- *Some forest ecosystems rich in Allanblackia might be set aside pending more knowledge through research.*

It is urgent that a full research programme be conducted to generate the necessary knowledge on the impact on wildlife, of removal from forest ecosystem of *Allanblackia* fruits, at a commercial scale.. Research is also needed to make adequate recommendations about alternative fruit removal strategies and/or feasibility of developing plantations of *Allanblackia* for commercial purposes.

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Country Focus: Morocco

Dr. Moulay Youssef Alaoui¹, Coordinator of the recently concluded wildlife project on wildlife in Morocco in a virtual conversation with Nature & Faune. Dr. Alaoui is also an avid reader of Nature & Faune.

Morocco has just concluded successfully, an interesting wildlife project supported by Czechoslovakia Republic and executed by Food and Agriculture Organization of the United Nations (FAO). As fallouts from the program, Morocco issued a number of technical reports and awareness raising documents. Nature & Faune carried out an email interview with Dr. Moulay Youssef Alaoui, forestry and wildlife practitioner in Morocco asking him about the country's experience in putting back wildlife into forestry.



Moulay Youssef Alaoui

Nature & Faune: Do you think wildlife is taken into account in forest management in Morocco? If yes, what practical steps has Morocco taken to realize this objective? To provide our readers insights of the situation in Morocco, please outline the way wildlife was integrated in forest management. Also address, among other factors, the institutional, legal and policy arrangements that were put in place to facilitate the integration of wildlife issues into forestry management in your country

Moulay Youssef Alaoui: For many years in Morocco, wildlife was never taken into account in the management of forests. The first Law on natural resources conservation (1917) dealt only with forest conservation. The achievements of the Forestry Administration have been remarkable throughout its history as far as forest management, reforestation and erosion control are concerned, on the contrary, wildlife management has been rather deficient. Thus, several wildlife species are either extinct or near extinction. The resources made available to the Wildlife and Nature protection Division (of which I was the Director from 1980 to

1990) have always been insufficient. It represented 10% of the budget allocated to the Forestry Department. More than 70% of the budget was allocated to the Reforestation and Erosion control Division – Service de la D.R.S (Service for soil protection and restoration).

On a positive note, a law on policing wildlife was promulgated in 1923 and its decrees facilitated the protection of rare species and laid the foundation for the management of wild animals. Thus, hunting days were reduced to 2 or 3 per week depending on the species and with a quota for each species. This quota, now termed PMA (maximum authorized capture) was established both for sedentary and migratory game. It is based on the estimated populations of different species in the absence of accurate census. Unfortunately, the provisions made for a rational management of wildlife would not stop the inevitable decline of several species and the extinction of some, even though they have been listed as protected species since the 1960s (barbary sheep, Dama gazelles, Dorcas Gazelles, Cuvier's Gazelles, hyenas, lynx, panther, etc.)

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The decline in populations of protected species and the extinction of some of them demonstrate that it is not enough to just prohibit the hunting of a particular species to safeguard it since other factors should be taken into account, especially the degradation of habitats and poaching.

Wildlife conservation and in particular of rare and threatened species was included in legal texts but success on the ground was not up to expectations. One of the main difficulties originated from the utilization rights granted to local populations by the 1917 Law on Forests Conservation. This Law transformed all forests into national forests belonging to the State which took over its management. In compensation, forest managers have granted usufruct to local populations (deadwood collection and grazing). Thus, it became practically impossible for wildlife to enjoy some quietude because of the constant presence of herds of livestock even in protected areas. For the conservation of some remarkable species (gazelles, barbary sheep, etc.) the Forestry Administration had to resort to fenced Reserves.

Nevertheless, it is worth noting that wildlife is now taken into account in forest policies. This positive change has its roots in the beginning of the 1990s when the Ministry of Water and Forests replaced the former directorate for forestry. One of the elements that triggered off this welcome change was the master plan for protected areas launched in 1992. It identified Areas of biological and ecological interest (SIBE: Site d'Intérêt Biologique et Ecologique) of which some are of interest for wildlife. It also formulated management plans for 2 existing national parks (Toubkal and Massa) and identified 3 other national parks. Integrating wildlife into the policy of the High Commission for Waters and Forests and the fight against desertification soon materialized into an FAO project titled 'Sustainable hunting Management for improved conservation and valorization of wildlife in Morocco'. This project had several components. One of the most important components aimed at supporting the forestry administration to develop a policy to enhance the value of certain species through ecotourism or through a sustainable hunting exploitation. This project effectively laid the foundation for a successful integration of wildlife into forest management in Morocco.

Nature & Faune: Could you kindly give details on the ramifications of this successful integration of wildlife into a sustainable management of Morocco's forests as well as the related issues such as improved incomes and food security. Link these points to the country's tourism industry and biodiversity.

Moulay Youssef Alaoui: As mentioned above, the GCP/MOR/031/CEH project included several components; one of the principal components was the sustainable management of hunting of large game species, specifically those that are of interest to sport hunting and ecotourism. Nevertheless, it was clear that the project must address administrative, legal and institutional issues to enable the different activities to generate jobs in rural areas and income for local populations.

The wildlife reserves established by the project or those created in the early 1980s by the Directorate of Water and Forests are undoubtedly a success story as far as wildlife populations' dynamics is concerned. The wildlife populations have increased exponentially, contributing to the overall conservation of biodiversity. These gains can be consolidated through the following ways:

(i) some reserves could be managed as 'nursery reserves'. The aim here is to increase the population of a given species through a well informed hunting managements (breeding, artificial feeding, water supply points) and putting in place anti-poaching measures e.g. by hiring watchmen from the local population. The management plan should determine the number of animals to be captured for release in other zones.

(ii) some of the reserves that are easy to access could be allocated to ecotourism. This option necessitates complementary measures such as the training of tour guides.

(iii) the third option is commercial/sport hunting. This option could be considered only in reserves with large wildlife populations and will enable the creation of jobs such as watchmen/security wardens, hunting technicians and hunting guides.

The integration of wildlife in forest policy was consolidated through an invitation to tender sent out for the development of ecotourism in the Souss Massa national park near Agadir. Apart from the last colony

of Northern bald ibis which represents the core and the reason behind the creation of the national park, there was a whole programme of reintroduction of Saharan big game (Addax, scimitar-horned oryx, Dama gazelle, etc.) into the park. The potential for these animals and their status has not been developed. Therefore, over the last three years, a tour operator has undertaken to promote eco-treks in the national park.

Nature & Faune : Mr. Alaoui, according to you, what is the most important lesson to be learned from your experience of the just ended project on wildlife?

Moulay Youssef Alaoui : This project had several components that were intended to create jobs in rural areas and generate income for the local populations. Decision makers are now aware that wildlife can only be conserved and developed when the local populations can benefit from it. There is a need to take regulatory and legal measures to translate these concepts into reality.

Nature & Faune : Thank you Mr. Alaoui for sharing your experiences in wildlife and forestry in Morocco.

16th African Forestry and Wildlife Commission and 18th Near East Forestry Commission Khartoum, Sudan, 18-21 February 2008

Summary report by Michel Laverdière¹

Background

Created in 1959, the African Forestry and Wildlife Commission (AFWC) is one of six Regional Forestry Commissions established by FAO to provide a policy and technical forum for countries to discuss and address forest issues on a regional basis. All African countries are members of the AFWC which meets every two years.

The 16th Session of the Commission was held in Khartoum, Sudan. It was for the first time jointly held with the Near East Forestry Commission, which was created in 1953. This report provides a brief summary of the salient points of the Session.

The session was attended by 124 participants from 29 member and observer countries, and 13 observer institutions from regional and international, intergovernmental and non-governmental institutions.

During a week, the chiefs of wildlife and forestry exchanged information and debated on forests and wildlife management issues in Africa; they also discussed current trends and policy issues relevant to forestry and wildlife in the region; and advised FAO and member countries on policy formulation and priorities for its forestry and wildlife programmes.

Results and Recommendations:

Sharing lessons from forestry and wildlife-related initiatives in Africa

The Commission was informed on the different programmes and partnerships in the sub-regions (with COMIFAC, SADC, ECOWAS and East Africa), and acknowledged FAO's continued involvement in these initiatives. It supported the Great Green Wall for the Sahara Initiative, which aims at addressing desertification and land degradation in the Sahel-Savanna zone of Africa.

The Commission was informed of the establishment of the African Forest Forum in late 2007. The African Forestry Forum (AFF) is an association of individuals who share the quest for and commitment to the sustainable management, use and conservation of the forest and tree resources of Africa for socio-economic wellbeing of its peoples and for the stability and improvement of its environment.

FAO forestry programme in Africa

The Commission was informed of the FAO forestry programme and took note of several examples of activities to support the member countries in forestry and wildlife sector development and of the achievements since the last Commission meeting. It was given an update on the FAO decentralization process in Africa, newly established sub-regional FAO offices, their location and staffing. The National Forestry Programme Facility and its facilitators located in Africa were introduced to the Commission.

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The role of wildlife and protected areas in the sustainable development of Africa

The Commission took note of the outcome of the 17th Session of the Working Party on Wildlife Management and Protected Areas, endorsed its recommendations and agreed to the inclusion of wildlife in its mandate. It further recommended that the terms of reference and mandate of the Working Party be revised in order to be operationally simplified and increase its relevance for the Commission.

Strategies and approaches to address human-wildlife conflicts: The Commission was informed of different strategies and approaches for the management of human-wildlife conflicts (HWC) and discussed the severity of it and its impact on food security.

Wildlife resources, food security and poverty alleviation: The Commission acknowledged that wildlife is not adequately addressed in poverty reduction strategies and that the economic value of this sub-sector is not well documented. It requested FAO and partners to assist countries in their efforts to document the value which wildlife brings to the local, national and regional economies.

Multilateral environmental agreements related to wildlife and protected areas in Africa: The Commission was informed of various multilateral environmental agreements and called for an integrated approach to wildlife and protected area management through programmes under conventions and with international organisations.

Partnerships to promote sustainable wildlife and protected areas management in Africa: FAO was invited by the Commission to form partnerships with environmental organisations in order to apply its knowledge in agriculture, forestry, wildlife and fisheries at the local level, to support local communities as well as to ensure that derived benefits are equitably shared. Countries were advised to review their policy and legislation accordingly.

Improving communication and information exchange: The Commission took note of FAO's work in information dissemination on wildlife and protected area management in Africa, particularly through the regional magazine *Nature & Faune*.

Forests and climate change in Africa and the Near East

The Commissions recommended that FAO and other members of the Collaborative Partnership on Forests (CPF) continue and increase their cooperation in forests and climate change. They further call upon FAO to organize regional workshops to share information and exchange experiences on forests and climate change, facilitate regional and sub-regional cooperation; and, while recognizing variability among their programmes, to develop unified approaches and positions. Furthermore, the Commissions requested FAO to assist member countries in their effort to mainstream Climate Change within their national forest programs.

Forests and Water Resources in Africa and the Near East

The Commissions recommended that (i) linkages between forests and water resources be studied further; (ii) integrated management of water and trees be encouraged, including incorporating forestry in the watershed management plans; and (iii) innovative mechanisms, including payments for environmental services, need to be put in place to ensure efficient and sustainable water, trees and forests management, using the likes of the Fouta Djallon Highland Integrated Management Programmes as an example; and (iv) recommended that FAO assist member countries to implement the voluntary guidelines.

Forests and Wildfires in Africa and the Near East

It was recognized that many countries in the regions lack adequate capacity and policy measures to manage fire effectively, including monitoring, early warning, preparedness, prevention, and restoration. The Commissions recommended that (i) local communities be trained and engaged in fire management; (ii) regional cooperation should be promoted, including the development of trans-boundary strategies; (iii) inter-sectoral approaches should be adopted for integrated fire management at local and national levels.

Forests and Energy

The Commissions recommended that FAO assist member countries in their efforts to enhance national and regional capacities for the development, implementation and monitoring of wood energy systems, including the establishment of information systems. The Commissions urged member countries to evaluate with care the costs and benefits of investing in bio-energy, as such investments may compete with food production and increase deforestation.

Side events

Taking advantage of the African Forestry and Wildlife Commission, three side events were organized by FAO and partners, on the following themes:

- 1) Community of Practice on Forests and Climate Change in Africa, organized by WWF – West Africa Regional Programme Office and FAO
- 2) National Forest programmes and the National Forestry Programme Facility partnerships in Africa, organized by FAO
- 3) Post-War Forest Sector Development in Liberia, organized by FAO and the Forestry Development Authority of Liberia

Conclusion

For the more than 130 country delegates and representatives from national and international institutions, the Commissions were a great success.

They sensitized all participants to the need to look critically at national and local forestry practices in the context of mitigation and adaptation to constant changes brought up by climatic extremes and variations that are often hard to predict. The role and importance of wildlife in forest management and poverty alleviation were also brought up convincingly, especially for the situation of Africa.

For the full report, visit - <http://www.fao.org/forestry/40495/en/>

Links

Basic Birdwatching Training for Amateurs in Morogoro, Tanzania

Tanzania is among Africa's richest country in birds with over 1115 species, about 700 of which occur in Morogoro region. Ten Important Bird Areas (IBAs) are recognized in Morogoro (Wambura, *et al.*, 2007).

From 25 to 26 July 2007 a basic Birdwatching training course for Amateurs was organized in Morogoro, Tanzania by Wildlife Conservation Society of Tanzania, Morogoro Branch (WCST-MB) and Uluguru Mountains Biodiversity Conservation Project (UMBCP). Financial support was provided by DANIDA and administered by local partners of BirdLife International. The training course drew 30 participants all of whom were amateurs. Four trainers were in attendant - two Danish naturalists Messrs Thor Hjersen and John Frikke; and two local naturalists Mr. John M. Wambura and Dr. Mokiti, T.C Tarimo both from Sokoine University of Agriculture.

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Bushmeat crisis: also a food security crisis for many forest-dependent people.

A CBD Technical Series publication "Conservation and Use of Wildlife Based Resources: The Bushmeat Crisis" (Nasi *et al.*, 2008), published by the Centre for International Forestry Research (CIFOR), the Wildlife Conservation Society (WCS), the Overseas Development Institute (ODI), and the Secretariat of the Convention on Biological Diversity (CBD) in 2008. <http://www.cbd.int/doc/publications/cbd-ts-33-en.pdf>
The full document is available electronically at www.cbd.int, and can be ordered free of charge in hard copy at: , or CBD Secretariat, 413 rue St. Jacques W, Suite 800, Montreal, QC, H2Y 1N9, Quebec, Canada.

A photographic series of bushmeat images from Bioko Island, Equatorial Guinea

Conservation International (CI) published in July 2008 a photographic series of bushmeat images from Bioko Island, Equatorial Guinea. Please see:

http://www.conservation.org/FMG/Articles/Pages/bushmeant_bioko_equatorial_guinea_part_I.aspx

Seed dispersal, especially by fruit bat *Eidolon helvum*, may be essential to the long-term viability of Iroko *Milicia excelsa* (formerly *Chlorophora excelsa*)

Milicia excelsa, commonly known as Iroko or Odum is a West African valuable tropical hardwood, threatened by over-harvesting and poor natural regeneration. To understand the role of seed dispersal in *Milicia excelsa* regeneration, focal trees were observed, seed rain was measured, and germination and predation trials were conducted on both dispersal and non-dispersal *Milicia* seed. Preliminary results suggested that seeds dispersed by *Eidolon* and seeds with the pulp removed had higher percent germination, and also escaped predation longer than reject seeds and seeds with fruit attached.

For the full paper refer to the publication:

Taylor, D.A.R., Kankam, B.O. and Wagner, M.R. 2000 The role of the fruit bat, *Eidolon helvum*, in seed dispersal, survival, and germination in *Milicia excelsa*, a threatened West African hardwood *In Research Advances in Restoration of Iroko as a commercial species in West Africa*. Edited by J.R. Cobbinah and M.R. Wagner 2000

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Theme and deadlines for Next Issue

The theme for the next issue of Nature & Faune is “Success stories in management of wildlife and nature in Africa”. The theme will focus on projects, programmes and other initiatives in wildlife, forestry and related fields in Africa, from local to national or regional level. There are a variety of projects and schemes initiated in Africa that go un-noticed and quite a few of them have made a difference, and yet they are still relatively unknown. A succinct presentation of an overview of these projects and lessons learned thereof would encourage people interested in this field to connect with kindred efforts in the region.

The next edition will thus look more in-depth at innovative and lesser known initiatives. It will aim to rekindle interest in field projects and capacity-building initiatives or simply networking of informational projects. It is a strategy to keep alive ideas that could enhance conservation of wildlife and natural ecosystems and at the same time improve Africa's rural peoples' livelihoods. This edition of Nature & Faune would offer project managers and natural resources practitioners a platform to tell stories of their projects thus offering readers the opportunity to communicate with them and exchange information on areas of common interest.

In order to facilitate contributions from potential authors, we have created guidelines for the preparation of manuscripts for Nature & Faune. Please visit our website or send us an email to receive a copy of the 'Guidelines for Authors'.

Deadline for submission of articles, announcements and other contributions is 15th December 2008.

Guideline for authors, Subscription and Correspondence

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Please send us your articles, news and reports because your experiences are worth sharing and have the potential of inspiring others. Please contact us.

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Nature & Faune is an international publication dedicated to the exchange of information and practical experience in the field of wildlife and protected areas management and conservation of natural resources on the African continent. *Nature & Faune* has been in wide circulation since 1985.

Nature & Faune is dependent upon your free and voluntary contribution in the form of articles and announcements in the field of wildlife, forestry and nature conservation in the Region.

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